British Guiana.

ADMINISTRATION REPORT

OF THE

DIRECTOR OF AGRICULTURE,

FOR THE YEAR

1930.

IMPERIAL MYCOLOGICAL
21 AUG. 1931
INSTITUTE

GEORGETOWN, DEMERARA:
PRINTERS TO THE GOVERNMENT OF BRITISH GUIANA.
"THE ARGOSY" COMPANY, LIMITED.
1931.

DEPARTMENT OF AGRICULTURE.

Head Office.

Director of Agriculture	...Prof. the Hon. J. Sydney Dash, B.S.A. (McGill).
Deputy Director...	...F. Burnett, M.C., M.A. (Oxon).

District Agricultural Superintendents.

East Demerara	.. E. M. Peterkin.
North West District	...E. Beckett, F.L.S.
Essequebo	...A DeK. Frampton, C.D.A.
West Demerara	...J D. Gillespie, B.Sc. (Edin).
Berbice	...H. Macluskie, U.D.A. (Aberdeen).
Essequebo (Assistant Agricultural Superintendent)	...A. A. Abraham,
Demerara (Assistant Agricultural Superintendent)	...H. D. Huggins, D.I.C.T.A.

Research—(Laboratories).

Entomologist	...L. D. Cleare, Jnr., F.L.S, F.E.S.
Botanist and Mycologist	...E. B. Martyn, B.A. (Oxon).
Chemist-Ecologist	...R. R. Follett-Smith, B.Sc., A.R.C.S.
Assistant Chemist	...C, L. C. Bourne.

Research—(Field Experiment Stations).

Livestock Farm, Georgetown— (Veterinary Surgeon)	...T. Bone, O.B.E., M.R.C.V.S.
Experiment Station (Sugar), Sophia— (Cane Agronomist)	...C. H. B. Williams, D.I.C.T.A.
Experiment Station, Georgetown	E. M. Peterkin.
Experiment Station, Cecilia	E. M. Peterkin.
Experiment Station, Hosororo, N.W.D.	...E. Beckett, F.L.S.
Experiment Station, Henrietta, Essequebo	A. DeK. Frampton, C.D.A.
Bush Lot Land Settlement Scheme	A. DeK. Frampton, C.D.A.

Botanic Gardens.

Superintendent in Charge	...E. B. Martyn, B.A. (Oxon).
Horticultural Assistant	...H. A. Cole.

Agricultural Instructors.

Resident Instructor, Berbice	...E. M. Morgan.
Resident Instructor, East Demerara	...C. C. Dowding.
Assistant Instructor, Essequebo Islands...	...J. E. Wilson.
Assistant Instructor, East Demerara	...D. D. Haynes.

Agricultural Assistants.

Experiment Station, Demerara	...J. Indrobeharry.
Experiment Station, Essequebo	...H. B. France.

Laboratory Assistants.

Meteorological Observer	...D. D. Blackman.
Entomological Assistant	...C. Williams.
Botanical and Mycological Assistant	...N. Persaud.

Clerical Staff.

Senior Clerk, Head Office	...J. F. Irving, M.C.
Accountant	...J. A. V. Bourne.
Librarian	...E. L. N. Boston.
Clerks	...J. Pestano, O. Bardon, D. M. Terrill, M. Cheong.
Clerk, Botanic Gardens	...G. L. Leitch.

Sugar Experiment Stations.

Committee.

Director of Agriculture, Chairman, *ex-officio.*

Hon. G. E. Anderson	...Pln. Diamond, E.B.	Representing the British Guiana Sugar Producers' Association.
Mr. A. E. Craig	...Pln. Ogle, E.C.	
„ J. C. Gibson	...Pln. Port Mourant	
„ C. Farrar	...New Amsterdam	
„ A. Murison	...Pln. Uitvlugt, W.C.	
Hon. R. E. Brassington	...Georgetown	

Staff.

Agronomist	...C. H. B. Williams, D.I.C.T.A.
Field Manager	...C. Cameron.
Laboratory Assistant	...L. A. Robinson.
Field Assistant	...L. A. Forte
Clerical Assistant	...J. B. Bourne.

In collaboration with the Officers of the Department of Agriculture.

C.S.O. No. 1404/31.

British Guiana.

ADMINISTRATION REPORT

OF THE

DIRECTOR OF AGRICULTURE,

FOR THE YEAR

1930.

Printed by the Authority of His Excellency the Governor.

GEORGETOWN, DEMERARA:

"THE ARGOSY" COMPANY, LIMITED, PRINTERS TO THE GOVERNMENT OF BRITISH GUIANA.

1931.

No. 15,728.

REPORT OF THE DEPARTMENT OF AGRICULTURE FOR THE YEAR 1930.

TABLE OF CONTENTS.

	Page.
Staff	1
Expenditure	2
Meteorology	3
Principal Crops	4
Minor Industries	18
Census Returns	20
Colonization and Land Settlement	21
Agricultural Investigations	21
Entomological Investigations	21
Botanical and Mycological Investigations	22
Chemical Investigations	22
Agricultural Education and Extension	23
Livestock	32
Botanic Gardens and Nurseries	32
Seed and Plant Distribution	33
Seed and Plant Exchange	33
Publications	34
Agricultural Legislation	34
General Remarks	35

REPORT OF THE DEPARTMENT OF AGRICULTURE FOR THE YEAR 1930.

I have the honour to submit the report on the work of this Department for the year 1930 as follows:—

PART I.—ADMINISTRATION REPORT OF THE DIRECTOR.

PART II.—REPORTS OF DIVISIONAL OFFICERS.

PART III.—REPORT ON THE BUSH LOT LAND SETTLEMENT SCHEME.

PART I.

STAFF.

2. Professor J. S. Dash, B.S.A. (McGill), attended the Conference of Directors of Agriculture held at the Imperial College of Tropical Agriculture, St. Augustine, Trinidad, as a representative of British Guiana, and was absent from the Colony from January 21 to February 2. During his absence Mr. L. D. Cleare, F.L.S., F.E.S., acted as Director until the arrival of the Deputy Director.

Mr. F. Burnett, M.C., M.A. (Oxon.), Deputy Director of Agriculture, arrived in the Colony on January 27 and assumed duty on that date.

Mr. E. L. N. Boston, 5th Class Clerk, was transferred to this Department from the Public Works Department on January 1, and was placed in charge of the Library.

Mr. H. D. Huggins, D.I.C.T.A., acted as Agricultural Superintendent, Berbice, during January and February.

Mr. J. D. Gillespie, B.Sc. (Edin.), arrived in the Colony on January 27 and assumed his duties as Agricultural Superintendent on the West Coast, Demerara.

Mr. Hector Macluskie, U.D.A. (Aberdeen), arrived in the Colony on February 3 and assumed duty as Agricultural Superintendent, Berbice.

Mr. E. M. Morgan, Resident Agricultural Instructor, Berbice, who was granted six months' leave of absence as from January 1, resumed duties on June 30.

Mr. J. F. Irving, M.C., resumed duty as Senior Clerk as from March 7.

Mr. L. D. Cleare, F.L.S., F.E.S., Government Entomologist, left the Colony for England on May 19 on six months' leave of absence. He resumed duty on December 9.

Mr. C. L. C. Bourne, Assistant Chemist, left the Colony on May 19 on six months' leave of absence, returning on December 9.

Miss J. Pestano, Record Clerk, left the Colony for Canada on June 30 on six months' leave of absence. Miss M. Smith was drafted into the Department to act as Clerical Assistant during Miss Pestano's absence.

Mr. E. G. A. Benson, B.Sc. (Agric.) (Lond.), Dip., Agric. (Wye), A.I.C.T.A., was appointed Grading Inspector in connection with the Rice (Export Grading) Ordinance, and Mr. A. W. Sears was appointed to the post of Examiner. These appointments took effect as from September 1.

Mr. H. B. France, Agricultural Assistant, was granted six months' leave of absence from July 14.

Mr. A. deK. Frampton, Agricultural Superintendent, Essequebo, was appointed Settlement Officer, Bush Lot Land Settlement Scheme, from May 10, in addition to his regular duties.

Mr. E. B. Martyn, B.A. (Oxon.), Government Botanist, was placed in charge of the Botanic Gardens in September.

Mr. A. A. Abraham, Assistant Superintendent, Botanic Gardens, was transferred to Anna Regina, Essequebo, and Mr. H. A. Cole brought to Georgetown, and appointed Horticultural Assistant, Botanic Gardens.

EXPENDITURE.

3. The total vote assigned to the Department by the Legislature at its session for the year 1930 was $117,568. The following expenditure was voted on Supplementary Estimate during the year 1930.

	EXCESSES TO BE MET FROM SAVINGS.	SUPPLEMENTARY APPROPRIATION.
Fixed Establishment.—		
Chemist-Ecologist	$ 2,250 00	
Agricultural Superintendent, Essequebo ...	630 00	
Unfixed Personal Emoluments.—		
Agricultural Superintendent, Berbice ...		$ 250 00
House Allowances to Agricultural Superintendents...		500 00
Grading Inspector		480 00
Senior Examiner		200 00
Wages of boys		250 00
Other Charges.—		
Expenses—West Indies Agricultural Conference, Trinidad		144 00
Passage of Mr. H. Macluskie from Trinidad to the Colony		24 00
Grants-in-aid to Agricultural Apprentices ...		450 00
Miscellaneous expenses—rice grading ...		575 00
Library and publications	150 00	
Stationery	100 00	
Freight and Insurance	75 00	
Experiment Station, Essequebo	400 00	
Passages of Mrs. H. Macluskie and children from England to British Guiana	224 00	
Passages of Mrs. F. Burnett and child from England to British Guiana	224 00	
	$4,053 00	$2,873 00

TABLE I.

ANNUAL ESTIMATES.

No. of Sub-vote.	Sub-vote.	Balances Unexpended.	Excess Expenditure.
1-29 (d)...	Personal Emoluments—Fixed and Unfixed	$ 1,777 76	
	OTHER CHARGES.		
30-31 ...	Travelling Expenses	88 17	
33 ...	Library and Publications	...	$ 84 97
34-38 ...	General Expenses	...	145 20
39 ...	Provision and Maintenance of Scientific Apparatus...	173 48	
40, 41, 57...	Botanic Gardens and Government House Grounds	32 40	
42 ...	Purchase, Production and Distribution of Seeds and Plants	9 51	
43-48 ...	Experiment Stations	794 65	
49 ...	Live Stock—Purchase and Maintenance of	34 75	
50 ...	Cutting Grass for Police Horses	5 83	
51 ...	Grants-in-aid for Exhibitions, &c.	269 95	
52 ...	Subsidies to Agricultural Instructors	...	
53 ...	Agricultural Apprentices	295 72	
54-55 ..	Veterinary and Plant Pest Preventive Measures	202 42	
56 ...	Contingencies	59 42	
58 ...	Purchase of Typewriter	15 00	
59-60 ...	Pln. Henr'etta, purchase of and conditioning of	763 47	
62 ..	Passage of Mr. H. Macluskie from Trinidad to the Colony	50	
64-67 ...	Passages of Mrs. F. Burnett and Mrs. H. Macluskie and children to the Colony ...	...	389 88
63 ...	Grants-in-aid to ex-agricultural apprentices	...	...
61 ...	Expenses, Agricultural Conference, Trinidad	16	
66 ...	Miscellaneous expenses, Rice Grading	2 26	
	TOTAL	$ 4,525 45	$ 620 05

The payments into the Treasury during the year were as follows :

Agricultural Stations	$1,833 68
Live Stock Division	1,114 49
Botanical Gardens, Economic and Ornamental Plants	557 05
Sale of Official Publications	59 12
	$3,564 34

METEOROLOGY.

5. The following are abstracts of the Meteorological observations recorded at the Botanic Gardens, Georgetown, and at the Penal Settlement, Mazaruni, during 1930 :—

Meridian of longitude for calculation of time adopted as standard in the Colony	60° W.
Hours slow of Greenwich time	3.45

Georgetown.

6. The meteorological station is situated in the Botanic Gardens at a distance of 1.45 miles south of the coast-line. The hours of observation are 7 a.m. and 1 and 6 p.m., local official time which is 3.45 hours behind Greenwich time. The height of the barometer is 6 feet 6 inches above the mean sea-level.

7. During the year 1930, the air temperature in the shade as recorded by the dry bulb Thermometer, for the months of January, February, March, May, June and July was lower than the mean shade temperature recorded over the period 1846-1929. The highest temperature recorded was 90.5° F. on the 21st November, while the lowest was 71.0° F. on the night of July 21. The mean shade temperature for the year was 80.5° F. or 0.1° higher than the average from 1846-1929. The total rainfall was 84.87 inches, as compared with 71.62 inches in the year 1929 and with 88.28 inches for the period 1880-1929. The total rainfall from January to April inclusive was 22.64 inches as compared with 19.23 in 1929. Heavy rains were experienced in the months of May, June and July. July was unusually wet, 21.64 inches being recorded, this characterizes the heaviest fall for July since these Gardens were in existence. For the months of July to December the rainfall was 36.67 inches or 3.54 inches below normal. The evaporation from a free water sur-

face, a six feet square tank at the ground level was 64.85 inches as compared with a normal evaporation of 57.90 inches; the evaporation for 1930 being 76.41 per cent. of the total rainfall. The total amount of bright sunshine for the year was 2,566.3 hours as compared with 2,474.4 in 1929 and with 2,461.6 hours in 1928 and with 2,364.5 hours in 1927 and was 108.2 hours above the average from 1816-1929. The mean radiation temperature (blackened bulb in vacuo) was 4.8° higher than normal and 0.2° F. higher than that of the previous year, the maximum monthly record during the year being 165.0° occurred on October 16. The mean minimum temperature on grass was 1.8 higher than the average. The mean velocity of the wind was 7.24 miles per hour, the maximum velocity being 18.75 miles per hour.

Mazaruni.

8. A sub-station established at the Penal Settlement, Mazaruni River, is in longitude 50° 38′ 45″ W. and latitude 6° 23′ 35″ N. at a distance of 42 miles South of the coast line. The hours of observation are the same as at the main station in Georgetown. The height of the barometer is 55 feet above mean sea level.

9. During 1930 the mean air temperature in the shade was 78.1° F., the maximum temperature recorded being 91.0° F. on March 18 and November 9, while the minimum 69° occurred on January 11 and 16, February 20 and March 29. The total rainfall was 77.96 or 20.62 inches lower than that of the previous year. The rainfall for the months of January, February, March, August, September and November was respectively 2.45, 3.91, 1.96, 1.16, 4.55 and 1.86 inches higher than that of Georgetown during these months. But the total rainfall for the year was 8.91 inches below that of Georgetown owing to the heavy rainfall in the latter locality during May, June and July. Rain fell on 225 days of the year as compared with 190 in Georgetown. The total amount of bright sunshine recorded during the year was 2,016.5 hours as compared with 2,566.3 hours at Georgetown.

PRINCIPAL CROPS.

Sugar.

10. The total area in sugar cultivation in the Colony during the year was 57,244 English acres as against 57,247 acres for 1929. The yield was equivalent to over 2.3 tons per acre. The area reaped, as shown by the census returns, amount to 54,264 acres yielding 127,764 tons sugar, while the export was 114,542 tons; as against the figures for 1929 of 117,254 tons produced from 56,126 acres, with an export for that year of 100,449 tons. The rum produced was 1,571,371 gallons of which 846,317 gallons were exported, as against an export of 1,109,482 gallons in 1929. The export of molasses was 3,851,337 gallons, while 431 tons of molascuit (cattle food) were exported. As in previous years the variety of sugar-cane mostly grown in the Colony is D. 625; there are also small areas of B.H. 10 (12), Diamond 10, Diamond 37, D. 118, D. 145, D. 109, R.P. 8, S.C. 12 (4) and D. 666/18 while several of the promising newer varieties grown at the Sugar Experiment Station are receiving attention in estate nurseries with a view to extension and trial on a larger scale. This applies particularly to D. 53/27 and P.O.J. 2878.

11. Table II. shows the acreage, production and exports under this crop from 1921 to 1930. Within the last two years two plantations have ceased to grow cane and have had their factories dismantled, while there are two other estates which are stated in authoritative circles to have taken steps to follow a similar course. It is interesting to observe that while the area under cultivation has considerably decreased in recent years, production has been steadily maintained, and, during the year under review surpassed all previous records. It cannot be doubted that the industry is now reaping the full benefit from expenditure on improvements during recent years, and this, together with a favourable season, the average yield per acre appreciably increased in consequence. One estate (Port Mourant) completed the crop with an approximate yield of 3.3 tons of sugar to the acre while

the Diamond group of estates with a production of 18,946 tons has exceeded all records as regards total output. In addition, the cost of production, both in the field and in the factory, has been very significantly reduced. With a view to affecting still further economies, the attention of planters has been drawn (in a circular with the necessary diagrams) to the advisability of giving some consideration to sledges as a possible means of transporting cane from the middle of the fields to the dam beds. Data collected from one estate on the use of Rototillers for interrow cultivation and seed bed preparation have also been presented in the Department's Journal.

12. The following statement shows the quantity and value of sugar exported for the past 10 years :—

Year.	Tons of Sugar Exported.	Value in Dollars.
1921	108,270	$ 10,099,891
1922	90,571	7,175,169
1923	83,167	10,237,450
1924	85,896	8,482,200
1925	97,728	6,785,740
1926	84,659	6,050,257
1927	109,616	8,787,585
1928	114,687	8,124,666
1929	100 449	5,943,788
1930	114,542	5,418,858

Table II.

SUGAR.

Year.	Sugar Cane acreage.	Tonnage of Sugar produced.	Tonnage of Sugar exported.	Rum produced proof gallons.	Rum exported proof gallons.	Molasses exported in gallons.	Molascuit exported in tons.
1921 ...	63,420	110,985	108,270	1,806,651	2,228,164	204	1,707
1922 ...	60,761	101,128	90,570	520,141	422,168	76,574	1,072
1923 ...	57,814	90,758	83,166	1,180,072	420,996	65,997	814
1924 ...	57,190	91,782	85,896	2,077,619	769,304	1,160,757	1,102
1925 ...	57,500	107,580	97,728	1,277,900	1,148,124	1,345,243	1,268
1926 ...	58,589	98,152	84,659	1,622,966	789,643	2,017,862	1,075
1927 ...	59,271	114,030	109,616	1,436,010	1,081,120	2,677,457	977
1928 ...	57,625	116,484	114,687	1,745,293	1,269,923	2,873,468	2,082
1929 ...	57,247	117,254	100,449	1,838,353	1,109,482	2,536,623	1,803
1930 ...	57,244	127,764	114,542	1,571,371	846,317	3,851,337	431

13. These accomplishments result from improvements which were made in cultural, manurial and factory methods in previous years when the industry gave profitable returns. Such achievements cannot, however, be regarded with unqualified satisfaction since there is evidence that the present crisis is adversely affecting :—

(*a.*) Field policy and practice, *e.g.*, mechanical tillage, use of fertilizers, replanting, etc. ;

(*b.*) Maintenance work, renewals and improvements, *e.g.*, drainage works, buildings, factory machinery, etc. ;

(*c.*) The number of overseers, chemists, engineers, etc., employed and their emoluments, leave, etc. ;

(*d.*) The average price paid for farmers' cane.

14. *Research.*—As has been previously pointed out, coincident with the reorganisation of the Department of Agriculture, a full programme of research has been organised for the benefit of the industry.

15. At the main station, Georgetown, cane experiments are still being continued as outlined in my report for last year. Further additional experiments have been laid down during the year as follows :—

(1.) Randomized variety trials.
(2.) Randomized manurial trials.
(3.) Distance of planting trials.
(4.) Bamboo under-drainage trials.
(5.) Flood-fallowing trials.

while the experimental work all over the Colony has been considerably extended and facilitated by the help of the recently appointed District Agricultural Superintendents. In order to ensure uniformity and efficiency in the execution of field experiments, a Committee of staff officers has been formed to advice in all matters pertaining to design, layout, control and conduct. It is gratifying to be able to record appreciation of the zeal with which the sugar interests are now co-operating with the Department's staff in the different phases of this experimental work.

16. The main lines of endeavour and the progress achieved are indicated below :—

(i.) *Soils.*—A survey has been made of the Central Sugar Experiment Station, Sophia.

A die-back of D. 625 at Bath Estate has been investigated from the edaphic viewpoint and a report submitted.

Special surveys have been carried out at Plns. Ogle, Uitvlugt and Leonora.

Samples have been analysed from all the fields on which co-operative experiments are being carried out on the estates. 423 samples have been examined from the sugar lands of the Colony.

The various factors connected with flood-fallowing are being investigated in the laboratory and by pot culture, preliminary to field work on the problem, and valuable data have already been secured. An examination of subsoil waters has been initiated.

(ii.) *Manures.*—Trials have been laid down at Hampton Court, Uitvlugt, Blairmont, Port Mourant and the Sophia Sugar Experiment Station (3) with a view to determining whether it would be of value to modify the present manurial policy by :—

(*a.*) varying the amount of Sulphate of Ammonia employed ;
(*b.*) substituting by-products of the leather industry for Sulphate of Ammonia ;
(*c.*) incorporating Fish Manure into local practice ;
(*d.*) varying the doses of Sulphate of Potash and/or Superphosphate of Lime, or adding or subtracting these fertilizers to or from the formulae now employed ;
(*e.*) substituting Rock Phosphate for Superphosphate of Lime ;
(*f.*) applying all the manures at once and early in the growth period instead of in two or more doses ;
(*g.*) substituting ground limestone for burnt lime or by adding ground limestone to the usual formula or to the new ones under trial.

These experiments are also designed to indicate the optimum economic dose of the manures to be used.

(iii.) *Varieties.*—Carefully planned variety trials have been initiated at Uitvlugt (2), Diamond, Lusignan, Blairmont, Port Mourant and the Sophia Sugar Experiment Station (3), to determine the value of certain of the most promising introduced and local varieties as satisfactory substitutes for D. 625, the standard cane.

17. Important distributions of planting materials have been made from the Central Station Sophia ; some 138,000 cuttings were sent out in 1929 and approximately 300,000 to the end of December, 1930. This is the largest quantity distributed in the Colony by the Station. A small quantity of the famous P.O.J. 2878 has now been sent to every estate in the Colony. 9,235 seedlings were raised in 1930 and a feature of this work has been the number of parents used. No less than 32 different parents or crosses have been tried. The 1928 and 1929 seedlings have been subjected to careful selection. A study of the parentage of the selected canes in these groups points to the cross S.C. 12 (4) by D. 625 being a very useful one,

and likely to yield a much higher percentage of promising seedlings than any other of the 20 combinations tried in 1929. The recently introduced varieties have been rapidly multiplied and P.O.J. 2878, G. 119, G. 153 have reached a stage where trials can be made in replicate plots during 1931. Varieties introduced during the year included B. 726, B. 417, Ba. 11569, Co. 210, Co. 213, Co. 281, Co. ?, P.O.J. 26, P.O.J. 253 and M. ?

18. Of the experimental results obtained to date, those from under-drainage with bamboo call for special mention, since the costs incurred were repaid in extra yield from the first reaping. This can be taken as an indication of the value of under-drainage in heavy clays typical of the sugar soils of this Colony. It must also be recognized that although primarily the experiment was laid out with special reference to drainage, the results obtained are, in some measure, undoubtedly due to the drains acting as subterranean irrigation channels, permitting water to pass in freely and upwards to the cane roots. Generally, the planters are viewing this trial with very great interest and already certain estates have taken up the question of subsoil drainage whilst other experiments are being laid down. The results of such investigation must have far-reaching effects on existing irrigation methods for it cannot be denied that the present system of supplying water to the growing crop is both wasteful and uneconomic.

19. Meetings of the Sugar Experiment Station's Committee have been held regularly at the Sophia Station when all important matters have been dealt with and opportunity at the same time taken to view the work in progress. Periodical visits of planters and others interested have been more frequent during the year and I would advocate strongly that more regular visits be made by the Deputy Managers and Overseers of estates to see the work that is being done. Arrangements for such will be readily made at any time.

20. *Cane-farming.*—One of the greatest problems the Colony is faced with at the present time is the economic settlement of the West Indian agricultural population and there is little hope of this being achieved successfully under existing local conditions, where the farmers live at a considerable distance from their farms, excepting through the medium of sugar cultivation. Holding this view which was further emphasised by the Sugar Commission, a questionaire has been circulated to the sugar estates. The results after being tabulated, will be available in any further attempt to stabilize the cane-farming industry. The Department considers that every effort should be made in this direction, notably on the East Coast of Demerara, where the population finds in sugar a crop to which it has long been accustomed and since, on the coastal clays (with the exception of rice) there is no other important money crop that can be grown.

21. *Grants-in-aid.*—One of the more important results of the visit of the Olivier Commission has been the great stress laid on the importance of the sugar industry to the Colony and the necessity for its preservation and protection by every possible means. While the Home Government found itself unable to take any action which would, perhaps, have brought about any definite improvement in values, substantial assistance has been provided by a loan to the extent of £40,000 free of interest for improving labour conditions on the estates. This together with certain other grants for definite relief works of public utility should help to minimize the unemployment situation resulting from the sugar crisis. In addition, a free grant of £2,475 has been provided by the Empire Marketing Board for 3 years' special work on the moth-borer problem, arising out of the visit in 1929 of Dr. J. G. Myers; the necessity for which was referred to and elaborated in my 1929 Annual Report.

22. *Canadian Tariff.*—Representations made in conjunction with the refiners resulted in the adjustment of the tariffs on "Invert Liquid Sugars." In this connection, a prominent Montreal broker writes as follows :—

"The new duties on Invert Liquid Sugar are now equal to the rates on "Solids in Tariff Item 134 and naturally the Canadian refiners are "pleased. This should mean a possible increase in the importation of "B.W.I. Raws into Canada to the extent of possibly 5,000 tons per year "or more. This unquestionably is one of the beneficial results to the "West Indies from your visit to Canada."

This question was referred to in paragraphs 19-22 of my Canadian Report and the change in the tariff took effect last May.

Rice.

23. The area occupied by this cereal during 1930 was returned as 49,702 acres, but including the second crop the area actually reaped was 60,342 acres. The yield was returned as 1,028,032 bags of 140 lbs. padi, equivalent to a yield of seventeen bags padi per acre, which although not exceeding in the aggregate last year's record production of 1,113,757 bags may be regarded as satisfactory considering the unfortunate weather conditions which adversely affected the crop in several districts.

24. The amount of rice exported was 22,480 tons with a value of $1,090,431 as against 14,091 tons with a value of $876,407 for 1929.

25. Table III. gives particulars of rice production and values for the past eight years.

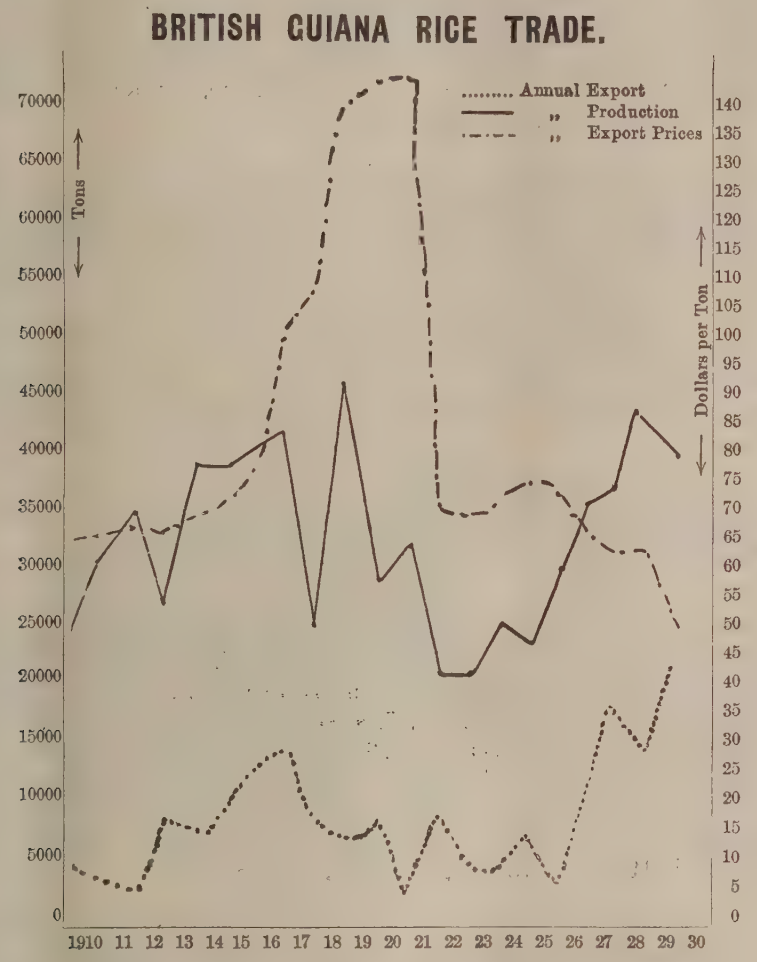
TABLE III.

Period.	Mean Rainfall Coastal Stations Calendar Year.	Areas under rice cultivation. British Acres reaped.				Yields.			Exports.	
		Berbice.	Demerara.	Essequebo.		British Guiana total acreage (reaped).	Padi tons.	Rice, tons (60% yield of cleaned Rice from Padi)	Rice.	
				Mainland	Islands				Tons exported	Value in dollars
1923 ...	80·9	16,460	10,824	7,010	4,421	38,715	33,270	19,962	3,971	273,687
1924 ...	83·54	17,196	10,978	7,383	4,715	40,272	42,100	25,260	4,470	312,567
1925 ...	63·25	16,524	10,093	8,655	4,618	39,890	38,403	23,042	6,918	523,964
1926 ...	74·76	23,871	10,920	9,351	5,303	49,445	49,899	29,939	2,914	218,146
1927 ...	118·63	19,184	13,788	12,585	4,870	50,427	59,748	35,848	11,497	723,871
1928 ...	96·48	20,938	17,002	11,744	5,876	55,560	61,144	36,686	18,083	1,114,147
1929 ...	71·62	26,729	19,927	10,477	6,308	63,441	72,096	43,257	14,091	876,407
1930 ...	84.87	25,370	17,489	10,253	7,230	60,342	64,252	38,551	22,480	1,090,431

26. Almost the whole area under rice is cultivated by small farmers who may either own or rent the land. The proprietor of the land often owns and operates a rice mill, he being normally assured of the crops of his tenants. The proprietor-miller in some cases also cultivates rice but as a general rule restricts his activities to milling and selling. All rice commercially cultivated in the Colony is lowland and aquatic in respect to environment and in certain districts there are two crops grown per year. The Autumn crop is the more important and is sown from April to June, the spring crop, planted only in those districts where the water supply and control are moderately satisfactory, is sown from November to December. The varieties in general cultivation usually occupy 5 or 6 months from the nursery stage to maturity.

27. During the year the West Indian market for rice continued to be affected by Indian competition and lack of efficient marketing of the local product, due to the large number of traders and others who compete with each other. Nevertheless, in spite of low prices during the last two years, the industry as a whole is receiving more serious attention on the part of those engaged in it than hitherto. The increasing use of selected seed together with the issue of grading certificates and the intensive marketing propaganda recently undertaken should result in better yields and more stabilized prices in the future. The following graph depicts pro-

duction, exports and export prices of rice over the 21 year period 1910-1930 inclusive :—



It may be noted that although prices have fallen considerably in recent years, the industry continues to expand, thus demonstrating the suitability of the crop to this Colony.

28. Whilst production continues to show an upward trend, culminating in a record export figure during the year, further considerable expansion in area under this crop will, in a great measure, be proportionate to the facilities provided for an assured water supply, *i.e.*, the improvement of conservancies, drainage and irrigation systems. For successful paddy cultivation a "regulated" water supply is essential and in spite of the Colony being well served by a number of rivers (where an unlimited water supply could be obtained) and conservancies, there is no co-ordinated irrigation system existent. The rainfall is much too uncertain as regards distribution ; the total annual mean rainfall varies within wide limits and may, in certain years and districts, be notably deficient. While certain areas suitable for paddy cultivation are often subjected to inundation, others again may produce poor crops owing to lack of rain when the grain is forming. These points are particularly stressed, more especially because of British Guiana's geographical position as regards markets, the suitability of this crop to her environmental conditions and the future economic welfare of the inhabitants who are becoming increasingly dependent on the large scale development of some export crop as an auxiliary to sugar.

29. Immediate improvements can only come from intensive cultivation of the land already under paddy, notably by the improvement of present varieties, mass seed selection in the field, manurial and cultural methods. Having this in view a lengthy memorandum was submitted to Government early in the year outlining the future methods of attack. This was followed by further recommendations as regards cultivating machinery, cleaners, threshers, etc., as a result of Mr. Douglas' visit which was referred to in last year's Report.

30. *Research.*—With the re-organisation of the Department and the appointment of trained Officers in the various districts, a definite programme of work has been organised on approved lines. Field tests are being conducted throughout the Colony and the best selections multiplied for distribution as they become available.

31. At the Central Rice Station, Botanic Gardens, progeny row selections for pure seed supply were continued, whilst definite randomized varietal tests were made with the following varieties, which had reached a sufficiently high state of purity to enable these tests to be accurately carried out (*vide* paragraph 49 of my 1929 Report):—

H. 7; No. 79; No. 76; No. 75;
Demerara Creole; Blue Stick; A. 16-34; C. 14-31;
Lady Wright; Mexican Edith; Carolina and Blue Rose.

These varieties are representative of the three main commercial rices—Japan, Carolina and Patna. The results indicate that even a higher yielding variety than either the Demerara Creole or Blue Stick varieties—the two local types—is already forthcoming, but tests during another season are necessary to fully establish this. The particular variety referred to is H. 7, a selection from Demerara Creole, which in a randomized test gave an increase of 13 per cent. over the latter. It was possible to extend the area for seed distribution at this Station during the year, notably in Demerara Creole, for which there was an increased demand. The total number of varieties under trial and observation at this station was 58. Manurial trials had to be deferred until 1931 due to lack of funds.

32. District experimental stations were opened at Henrietta, Essequebo, and Plantations Port Mourant and Rosehall, Berbice, where varietal tests were made with the same varieties as at Georgetown. In the Berbice District No. 79 gave the largest yields under general conditions, but the experimental area was subjected to heavy flooding in the early stages and further trials will be again carried out next year. In the Essequebo District, No. 79 was also ahead, although there was little significant difference between Nos. 79, 75 and Demerara Creole. In all trials, however, the American varieties, *e.g.*, Blue Rose, Mexican Edith, Carolina and Lady Wright gave consistently poor yields.

33. As was to be expected, the time taken from the date of sowing to maturity of the different varieties greatly varied. In this connection, one important aim is to obtain a "short age" variety suitable for the spring crop; to date, however, all short cycle paddies tried have proved notoriously poor yielders under local conditions. Every effort is being made, not only to secure heavy yielding varieties, but types that will be suitable for overseas markets. Progress in this direction is encouraging as pure line selections in both Demerara Creole and Blue Stick are acceptable in Canada.

34. Milling tests were also carried out and the figures showing the average percentages of rice obtained in each case are given in the respective Agricultural Superintendents' Reports. With the exception of Blue Rose which only gave 59 per cent., the average percentages varied from 65 to 69 per cent. and established the fact that the two varieties commonly grown in the Colony yield much more than the usual return allowed when paddy is purchased by the miller.

35. The establishment of field competitions in the paddy growing areas has helped to increase the supply of seed for distribution and has served not only to demonstrate the value of pure line seed—in some cases yields of 8 to 10 bags more per acre were obtained over ordinary seed—but to indicate lines along which further information as regards behaviour of varieties in different districts is required, and which will be investigated if funds permit. Particulars of the work described above and other observations on various experiments in progress will be found in the reports of the Agricultural Officers appended.

36. *Grants-in-Aid.*—Due unfortunately to the lack of funds, the bulk of the seed grown under private arrangements during the year could not be purchased, stored and utilized to the fullest advantage for seed purposes. In this respect, it is gratifying to know that recently a free grant of £4,250 and a loan of £800 free of interest repayable at the end of five years, has been made from the Colonial Development Fund. This assistance from the Fund is made up as follows :—

(1) A free grant of £1,700 to meet the cost of paddy seed barns and weigh-machines for five district stations.

(2) A loan of £800 for five years on the terms stated above to provide a revolving fund for the purchase and distribution of seed.

(3) A free grant of £850 per annum for three years to meet the salary of a plant breeder.

37. Plans for paddy barns have already been approved for construction in the following centres :—No. 63 Corentyne, New Amsterdam, Berbice; Experiment Station, Demerara; Anna Regina, Essequebo. The seed thus obtained will be first distributed to selected private seed farms in each district for further multiplication under the guidance of the Agricultural Superintendents. Government certificates will be issued for the purity of the seed—conditional of course that the instructions of the Agricultural Superintendents have been carried out—which should secure a higher price for such seed. Normally, the cultivator is in need of ready cash at harvesting time and must of necessity dispose of his entire paddy crop; the revolving fund, made possible by the loan, will enable purchases of the pure seed grown to be made at harvest and supplies held for the convenience of growers, thus ensuring that the bulk of the seed intended for sowing the next season's crop will not be sold to millers. In this way, a guaranteed selected pure seed supply will be built up, and it is hoped that from the third crop after the commencement of this scheme there will be sufficient pure seed available to plant up the whole of the rice area of the Colony, the ten acre blocks being regularly used as a nucleus for maintaining purity. The execution of this programme is not an easy undertaking and much hard work will devolve on the Agricultural Superintendents to make the scheme a success. It is, however, the only recognised method of securing the general use of pure seed among peasant cultivators. Based on the yields obtained in the Districts, as indicated by the result of the competitions previously referred to, it will be readily appreciated what substantial benefits will accrue to the industry and the Colony when every acre is planted with pure line seed.

38. *Rice-Milling.*—An investigation into the milling methods employed in British Guiana, made by the Agricultural Officers during the year, showed that the type of machinery in use, although simple, is generally inefficient. The milling machinery consists invariably of the Engelberg Huller type and, with the large or powerful engines used for driving the mills and consequent high pressure, results in a very large percentage of broken grains. In the Canje and Crabwood Creeks some of the establishments are very primitive, although it is worthy of note that since the grading regulations have come into force separating machines are being installed in some of the more up-to-date factories in the various districts. The

average size of the factory is small, whilst from the census made, the number is comparatively large. The system of soaking the paddy often leaves much to be desired, barrels being utilized instead of proper tanks and, further, the water used for soaking purposes varies considerably in quality from ordinary trench water to clear artesian well water. High quality parboiled rice can never be made where dirty water is used, however good the paddy. These matters are now receiving the close attention of the Divisional Staff.

39. Parboiled rice is the type exported from British Guiana at present and with a view of obtaining machinery to deal with all classes of rice, assistance has been sought from the Empire Marketing Board for the erection of a model-up-to date milling plant to turn out not only parboiled rice but cargo and white rice, especially as enquiries for the latter are being received from new markets. This will serve the purposes of demonstration and investigation and it is proposed to erect it at Anna Regina.

40. One of the recommendations resulting from [the Director of Agriculture's Mission to Canada (referred to in last year's Annual Report) and strongly emphasised, is that as the white rice trade is so firmly established in Canada, it may be possible to dispose of high grade parboiled rice (incorrectly styled "*brown*") in that market, but on the other hand it will probably be easier to build up a rough rice export trade to the Canadian mills. As mentioned above, negotiations have already been made to introduce machinery which will facilitate the preparation and grading of rough rice for this trade. Meantime, a trial shipment of 28 tons of Blue Stick paddy was sent to Montreal under the auspices of the Department whilst another consignment was sent by private interests to Vancouver during the year. The report received on the first consignment was satisfactory, but there was some controversy over the quality of the latter consignment on arrival at Vancouver. It is necessary to issue a warning here that the indiscriminate shipment of paddy will ruin the Colony's chances in outside markets requiring rice in this form. The Department will be glad to advise as regards type, moisture content, etc., of paddy intended for export. Indeed, as soon as pure seed is more generally grown in the Colony, the grading of paddy will be a requisite factor in the trade development which is bound to follow.

41. *Grading.*—For some months prior to the establishment of grading, prolonged discussions took place in the Rice Committee of the Chamber of Commerce with the Director of Agriculture as regards the means and staff necessary, the basis on which regulations could be enforced and the methods to be employed in making them effective. This culminated in the appointment of a Sub-Committee of which the Director of Agriculture and the Deputy Director were members, the former being Chairman. With the existing industrial methods the only system of certification on any grade to be of value, would be to take an average sample from each bag immediately before shipment and a certificate issued based on the colour and percentage of broken grains. The Department was deputed to draw up average samples accordingly. Before this could be done, however, all the various grades from as many mills as possible and the merchants throughout the Colony were obtained. This proved a very laborious task and after a most exhaustive analysis, the grades recommended were discussed and approved at a meeting of growers, millers and merchants called together for that purpose by His Excellency the Governor. An ordinance was accordingly drawn up and introduced to the Legislative Council by the Director and finally passed, and the Governor-in-Council approved of the regulations coming into force as from October 1. Both the Ordinance and Regulations made thereunder have received wide publicity. Minor amendments were made later, based on the recommendations of the buyers in the Islands and the final grades are now as follows:—

Class.	Description.	Colour.
Whole grain super ...	Not to exceed more than a total of 5 per cent. of broken and discoloured grains ...	As per guide sample.
Super	Not to exceed more than a total of 12 per cent. of broken and discoloured grains ...	Do.
No. 1	Not to exceed more than a total of 25 per cent. of broken and discoloured grains ...	Do.
No. 2	Not to exceed more than a total of 40 per cent. of broken and discoloured grains ...	Do.
No. 3	Not to exceed more than a total of 50 per cent. of broken grains. No fixed colour standard	...
Super broken ...	Same colour standard as whole grain super or super; containing more than 50 per cent. broken grains	...
Broken	Any colour below super; containing more than 50 cent. broken grains ...	...
White Rice Quality A....	To be dry, reasonably clean, white; and to contain not more than 5 per cent. of discoloured grains. (Grains may be of irregular size and broken) ...	As per guide sample.
White Rice Quality B....	To be dry, reasonably clean, white; containing more than 5 per cent. of discoloured grains. (Grains may be of irregular size and broken)	Do.

42. Grading offices were opened in Water Street and New Amsterdam, Berbice, and the preparation of guide samples commenced. A grading officer with assistants was appointed to carry out the work in Georgetown whilst the Agricultural Superintendent for Berbice acts as grading officer in addition to his regular duties.

43. It was hoped that the separating of the broken grains from the whole grains would be performed by a grading machine, but early trials proved inaccurate for the purposes of the Ordinance and in consequence all the guide samples had to be prepared by hand. Indeed, not until the end of the year was a suitable small hand separating machine obtained and this is now functioning. Up to this time, all the samples had to be analysed by hand. The machine is called the Crantex Grading Machine. The method employed in analysing is to take samples up to 10 lbs. in weight from 25 per cent. of each consignment, and in order to reduce the "probable error" of sampling, five samples are taken of this amount and the broken and discoloured grains removed. The average of these determines the grade. In some cases, if weevil or mixed grades are suspected, a whole bag or bags are selected at random and subjected to more minute examination.

44. The summary below gives full particulars of the rice exported from October 1 when the regulations came into force up to the end of the year and the percentage according to grades :—

NO. OF BAGS GRADED, GEORGETOWN.

Month.	No. of Certificates issued.	Whole grain super.	Super.	No. 1.	No. 2.	Ungraded	White Rice.	Super broken.	Total No. of bags.
October	294	188	1,210	4,186	11,358	3,952	226	66	21,186
November	388	425	1,835	5,175	12,063	7,567	102	100	27,267
December	325	6	936	3,647	9,842	7,387	317	267	22,302
Totals	1,007	619	3,981	13,008	33,263	18,806	645	433	70,755
Percentage according to grades ...		0·87	5·63	18·38	47·02	26·58	0·91	0·61	100·00

NO. OF BAGS GRADED, NEW AMSTERDAM.

October	21	...	...	...	1,143	982	...	...	2,125
November	18	...	...	...	1,258	2,189	...	...	3,447
December	18	...	...	...	1,754	1,684	...	...	3,438
Totals	57	...	...	...	4,155	4,855	...	...	9,010
Percentage according to grades ...	...	...	...	...	46·1	53·9	...	...	100 00

45. *Markets.*—A considerable amount of propaganda with a view to expansion of markets was undertaken by the Department during the year and a brochure "Buy Demerara Rice"—the appearance of which synchronised with the coming into force of the grading regulations—was prepared and circulated to the Caribbean

Islands and adjoining territory as well as North and South America. A post office stamp advertising Colony rice has also been adopted on all outgoing letters from British Guiana. Guide samples and copies of the grading regulations were freely distributed to responsible persons and bodies outside the Colony, including Banks, Consuls, Chambers of Commerce, Departments of Agriculture, Trade Organisations, etc., while the Agricultural Officers prosecuted a vigorous educational campaign in the districts amongst millers and cultivators. From Table III. above (showing the amount of rice exported during 1930), it will be seen that the introduction of grades and the advertising campaign undertaken by the Department have not been in vain, since every island and country in this zone are now giivng Demerara Rice a trial. The following shows the destination of rice exports for 1930, and indicates that the markets for Demerara Rice have appreciably increased :—

United Kingdom.	Canada.	Bermuda.
British West Indies.	Cuba.	United States.
British Honduras.	Haiti.	Costa Rica.
Santo Domingo.	Porto Rica.	Portuguese Possessions.
French Guiana.	Dutch Guiana.	French West Indies.
Dutch West Indies.	Venezuela.	

46. Advantage was taken of the Colony's participation in the Nova Scotia Provincial Exhibition held in Halifax and the International Grocers' Exhibition in London to exhibit Colony Rice. 10,000 samples of Demerara Rice were distributed at the former Exhibition together with suitable literature and, at the Grocers' Exhibition, 5,000 copies of an informative memorandum were circulated together with samples put up in fancy cartons. Show cards were also prepared showing the rice and paddy in straw, under celluloid. A display was also arranged at certain London stores. The Department is greatly indebted to Messrs. Geddes Grant, Halifax, and the West India Committee through Sir Algernon Aspinall for indefatigable assistance readily given in connection with these displays.

47. At the end of the year consideration was being given to the possibility of sending an advertisement of Colony rice to Buenos Aires during the Exhibition as well as translating into Spanish the English Edition of the brochure "Buy Demerara Rice" issued by the Department referred to in paragraph 45 supra.

48. An article was prepared by the Director of Agriculture for publication in the "Montreal Daily Star"—West Indies Edition—outlining the growth and development of the Rice Industry of the Colony. As a result of this and the efforts above enumerated, numerous enquiries have been received and the Georgetown Chamber of Commerce have been kept fully informed of all developments at the various meetings attended by the Director. In this connection mention should be made of the valuable help freely rendered by the Royal Bank of Canada through its Supervisor, Mr. F. C. Harding, at Trinidad.

49. These efforts led to steps being taken during the year to organise a Rice Exporters' Association under whose ægis all rice was to be exported from the Colony at fixed competitive prices, preventing price cutting and reducing to a minimum the peddling of rice carried on in the Islands by the irresponsible trader. Attempts to bring all factions together have, however, proved fruitless on account of the vicious financial circle which prevails locally—merchant, miller, landlord, cultivator—all living out of the industry with, generally speaking, small profits to the growers.

50. *Economic Investigations.*—Unfortunately, too, there are other factors adversely affecting the industry which are often to be met with —

(1.) the system of breaking in new land owned by proprietors at the cultivators' expense ;
(2.) high rents and high rates of interest charged on loans ;

(3.) compulsory sales at landlord's prices, when paddy is grown on their estates;
(4.) exorbitant milling charges.

These and other anomalies are being closely investigated by the District Agricultural Superintendents to whom a questionnaire on all phases of rice culture has been circulated. It should be stated that the results obtained during the year on the Bush Lot Land Settlement point to the lines along which the rice industry can be made to prosper. Persistent effort is essential coupled with educational work on co-operative methods.

Coconuts.

51. The area under coconut palms in 1930 shows a slight decrease. The exports for 1930 were as follows:—coconuts—629,371 valued at $7,845; coconut oil—26,377 gallons, valued at $16,059; and copra—2,010 tons valued at $143,422. It is hoped that the exports in oil will increase as a result of the establishment of an edible oil plant by Messrs. Wieting & Richter, Ltd.

52. The coconut industry generally speaking still remains in a neglected condition, as pointed out in my report of last year, and until the Department of Agriculture is provided with the facilities for demonstrating how a coconut plantation can be established and maintained on sound economic lines, the industry is not likely to make rapid progress. The impression in this country, is that once the crop is established it can very well look after itself. Very little attention is paid to the selection of seed nuts, soils on which seedlings are planted, soil requirements, *i.e.*, whether or not the land is too heavy or unsuited to coconut cultivation, drainage, weeding and underbushing and the collection and burning of husks and other debris.

53. In consequence of this and the unsanitary conditions in which the majority of coconut estates find themselves to-day, excellent breeding grounds are provided for pests and diseases, which have been much more in evidence this year than previously. In this connection, however, it should be noted that with the appointment of Agricultural Superintendents in the districts who are now paying particular attention to this crop, the danger of such attacks are being brought more forcibly to the notice of the proprietors.

54. Three particularly bad outbreaks of the following occurred during the year under review:—

Coconut Caterpillar (*Brassolis sophorae L.*).
Coconut Stem-Borer (*Castnia daedalus Cram.*).
Large Locust (*Tropidacris latreillei Perty*).

55. In the first instance, one particular estate on the East Coast, Demerara, and many of the smaller adjoining coconut allotments have been severely damaged by the ravages of the Coconut Caterpillar (*Brassolis sophorae*), and had it not been for the aid given by officers of the Department these cultivations would have been wiped out. Vigorous control measures were organised, such as the removal of all dead branches and "nests," the collection of husks, carrying out weeding operations and generally cleaning up of the properties. This entailed considerable expense and work, due to the density of the undergrowth and to the large quantities of husks that had been allowed to accumulate. Further, hand collection of the pests in all its stages was carried out by gangs, whilst the artificial breeding of parasites was done on the Letter T and Park Estates and also at the Laboratory in Georgetown under the supervision of the Laboratory Assistant. The attack was very severe and before these remedial measures could make themselves felt considerable damage had been done throughout the areas in the Mahaicony-Abary Districts. In all 15,978 lbs. of caterpillars were collected during a period of 9 weeks and destroyed on one estate alone, which indicates both the severity of the attack

and the intensive campaign waged against this pest. Special effort was also made to induce the small holders adjoining the estates to clean up their cultivations, etc., but only with partial success and it would appear that the only remedy for such cases in future will be to enforce the Plant Pests Ordinance. Combined efforts by the small holders with small allotments of coconuts are absolutely essential, as otherwise such areas become breeding grounds and sources of infestation to adjoining properties.

56. An outbreak of Coconut Stem-Borer occurred at the Le Repentir Cemetery, Georgetown, and considerable damage was done. Infected trees, however, were treated (the majority being young trees) and to date it appears that the results of such treatment have given satisfactory results.

57. An outbreak of Large Locust (*Tropidacris latreillei*) also occurred at Hope Estate, East Coast, Demerara, but, due to the intensive concentrated efforts made by the estate management in dealing with this pest very little damage was done. Great credit is due to the authorities of Hope Estate for the manner in which this problem was tackled.

58. The wilt disease of coconuts referred to in my report of last year has again been observed in several districts ; this disease is also prevalent in Trinidad, where it is looked upon as a major disease.

59. Investigations of soil conditions have been made at various centres, reports correlated and with recommendations for ameliorative measures sent to the managers and property-owners concerned. The problem is receiving the close attention of both the Chemist-Ecologist and Mycologist and collaboration with the Trinidad authorities has been definitely established with a view to securing as much experimental data as possible in the two Colonies. It may assume serious proportions where soil conditions are defective and the palm poorly nourished.

60. *Canadian Tariff.*—The position in respect to the Canadian Tariff as affecting the trade in coconuts was reviewed with the Chamber of Commerce during the year. It will be remembered that whereas under Item 113, coconut, desiccated, sweetened or not, paid a duty (British preferential) of 5 cents per pound, a recent change introduced another item allowing entry of coconut, dessicated, unsweetened at 2 cents per pound. This change made it possible for Ceylon desiccated coconut to enter the Dominion at prices which permitted it to compete freely against desiccated coconut made in Canada from imported West Indies and British Guiana whole nuts. Further, the buyers had stated that this change would mean a serious curtailment in their requirements of such nuts, unless obtained cheaper than at present. Thus, a blow was being dealt to the growing trade in whole nuts. It is satisfactory to note that the duty on desiccated nuts has reverted to the former rate of 5 cents per pound as a result of these discussions and the necessary representations.

61. The following table gives particulars of coconuts, copra and coconut oil during 1930 :—

TABLE IV.

COCONUTS, COPRA AND COCONUT OIL.

Periods.	No. of Acres (British) under cultivation.	No. Exported to nearest hundred.	Value in Dollars.	Copra, lbs.	Value in Dollars.	Coconut Oil, gallons.	Value in Dollars.
1923	22,970	2,659,000	...	941,000	...	26,621	...
1924	25,201	1,559,800	24,413	1,848,896	71,495	21,804	17,443
1925	29,879	1,363,280	34,293	1,935,110	96,110	20,394	30,394
1926	26,502	816,000	18,727	3,820,432	190,055	18,778	18,590
1927	27,790	334,000	6,015	2,605,818	116,525	25,326	25,326
1928	28,000	322,000	5,944	7,841,904	352,522	26,244	26,206
1929	28,000	637,812	10,614	8,420,160	314,350	20,862	16,730
1930	26,665	629,000	7,845	4,502,400	143,422	26,377	16,059

Coffee.

62. The acreage under this crop during 1930, according to figures furnished the Department, is 5,096 acres. The exports were 367,261 lbs. valued at $22,400 as against 907,026 lbs. valued at $104,135 in 1929.

63. Coffee planting is the most important agricultural occupation in certain areas of the Colony, notably the North West District and the Pomeroon; the census returns show that there were 5,096 acres under coffee in 1930, this area being the fourth largest under any single crop and the second largest under any permanent crop, the acreages under sugar cane, rice and coconuts alone being greater.

64. The crop is very largely established on pegasse soils—a soil type notorious for its inability to support economically any permanent crop of value other than Liberian coffee; in consequence, the coffee planter has in most cases lapsed into a dependance on coffee as his only source of revenue.

65. The market for the product is to a considerable extent a local one. If allowance be made for young coffee trees not yet producing and areas not in full bearing, the total production is estimated at 1,800,000 lbs. In 1930, 367,261 lbs. were exported; hence a reasonable estimate of local consumption may be placed at 1,000,000 lbs.

66. With the world's over production, the industry is at present undergoing a severe crisis and possibly the most disastrous since coffee growing has been established in this Colony. Prices have dropped to as low as three cents per pound for the dried beans, and in consequence the crop is only being partially harvested by the tenants or owners themselves, as it does not pay to hire labour; the cost of picking exceeding the value of the berries picked.

67. In view of the above, His Excellency the Governor appointed a Coffee Committee (with the Director of Agriculture as Chairman) with the following terms of reference :—"To consider what steps should be taken to improve and assist the coffee industry of the Colony, both in regard to local and foreign markets." The Committee sat on six occasions and the recommendations made may be briefly summarised as follows :—

> That a Coffee Trust be formed and be empowered to obtain loans, on Government's guarantee; with these loans enough coffee to supply the estimated local consumption would be taken over at production cost from the growers and released to coffee traders at a cost fixed by Government. Finally, legislation would be required to permit the trust wholly and entirely to control local trade supplies. (Sessional Paper No. 12 of 1930).

68. In addition to these recommendations special visits have been made to the North West District by the Director of Agriculture and the Deputy Director. Discussions on the spot with the farmers were held and later in conference with the Commissioner of the North West District further recommendations were submitted. The most important of these advocated the erection of mechanical dryers. The prepared coffee beans produced for the most part by primitive methods in individual farms at the present moment are of a poor quality, and the product is lacking in uniformity. Liberian coffee at best enjoys a limited demand and with the present glut of higher grade coffees, the demand is further restricted and it is difficult to dispose of at any price. There is naturally a better demand for high grade Liberian such as produced by Messrs. Garnett & Co., and if similar facilities could be provided for the drying and manufacture of the peasant grown coffee, it is felt that better prices could be obtained. The whole question is still under the consideration of the Government. It will be remembered in the re-organisation plans and policies of the Director, the necessity for such machinery was stressed. (Para. 9 of Combined Court Paper No. 16 of 1927).

69. The fungus *Sclerotium Coffeicolum* is still much in evidence in the North West District, more especially in the Koriabo District although not so prevalent as it was in 1929. At the present time its spread in certain plantations is being assisted by neglect of weeding and drainage of the cultivations, the farmers generally being unable to pay the costs of such work. Those farmers, however, who are still being financed by traders, have kept their cultivations clean and their drainage in good order and in consequence the disease is scarcely noticeable. If the present position does not shortly improve or assistance be given to the industry, many of the cultivations will either disappear or be abandoned, since the fields, with astonishing rapidity, become overrun with wild shrubs and various weeds, the trees themselves being covered with bird vine and other creepers.

70. Meantime the department is endeavouring to encourage farmers to diversify the present system of agriculture by growing a greater number of economic crops. When the land is newly reclaimed, excellent ground provisions are obtained for the first two or three years, but after that period, it has been found extremely difficult to establish any other permanent crop than Liberian coffee. It is significant that efforts to establish commercial banana growing on such lands have resulted in failure. If funds are available, manurial experiments with ground provisions and other crops will be conducted at Hosororo during 1931, but it must be remembered that sound economic diversified agricultural holdings can only be built up gradually

TABLE V.

Periods.	No. of Acres (British) under Cultivation.	Coffee Exported, lbs.	Value in Dollars.
1914-1918 ...	4,713	342,190	
1919 ...	5,125	936,540	
1920 ...	5,032	407,900	
1921 ...	5,030	405,104	
1922 ...	4,240	808,640	
1923 ...	3,916	535,136	
1924 ...	5,765	513,115 ...	56,075
1925 ...	6,243	663,029 ...	114,593
1926 ...	5,226	773,257 ...	132,623
1927 ...	5,272	430,543 ...	68,844
1928 ...	5,894	919,772 ...	137,933
1929 ...	5,905	907,026 ...	104,135
1930 ...	5,096	367,261 ...	22,400

PARA RUBBER AND BALATA.

71. The area returned under Para Rubber is 1,400 acres. The actual area is much greater than this but owing to the low price of rubber and the present endemic leaf disease large areas are no longer considered in the returns. The export for 1930 was 46 cwts. as against 15 cwts. in 1929.

72. The Export of Balata (*Mimusops Globosa*) was 8,888 cwts. valued at $390,292 as against 5,356 cwts. valued at $231,651 in 1929.

MINOR INDUSTRIES.

Cocoa.

73. The position in regard to this crop remains in very much the same state as last year. During the past 10 years the acreage under this crop has diminished due largely to the inroads of witchbroom disease, which, unless carefully watched, spreads rapidly resulting in depleted yields and debilitated trees. Under present conditions little hope can be held out that the industry will ever assume any importance in the Colony.

TABLE VI.

Periods.	No. of Acres (British) under cultivation.	Cacao exported. lbs.	Raw Cacao and prepared Cacao imported. lbs.
1904–1908 ...	1,940	73,100	20,590
1909–1913 ...	2,140	54,500	20,970
1914–1918 ...	2,114	34,670	54,020
1919 ...	2,147	9,520	102,580
1920–1922 ...	2,020	(1920) 24,192	(1920) 179,120
1923 ...	1,903	none	189,063
1924 ...	1,918	,,	188,373
1925 ...	1,918	,,	218,306
1926 ...	1,287	,,	174,085
1927 ...	1,256	,,	166,539
1928 ...	1,202	,,	153,760
1929 ...	1,438	,,	123,972
1930 ...	1,438	,,	114,282

Citrus.

74. During the year increased interest has been evinced in citrus growing throughout the Colony. The demand for budded grapefruit has far exceeded the supply and at the present moment orders are outstanding to the extent of 4,000 waiting to be filled. Our greatest difficulty is in obtaining sufficient budwood and for this material we are dependent on outside sources for our supply, *e.g.*, Trinidad and Dominica. Recent consignments have arrived in a damaged condition and in consequence considerable time must elapse before we are in a position to fill the orders as rapidly as they come in. I anticipated this demand and had during the two previous years, planted 10 acres of selected budded citrus at Hosororo in the North West District. These plants have continued to make excellent growth but it will be at least two or three years yet before budwood can be obtained from them. Large nurseries for supply of all citrus plants have been opened at the Botanic Gardens and at the Experiment Station at Hosororo ; the plants from the latter station will be chiefly utilised for distribution to farmers in the North West District in order to assist in the diversifying of their present system of agriculture.

75. Citrus cultivation is undoubtedly suited to the lateritic soils of the North West—unfortunately limited in extent. Interest in the lime industry has also been resuscitated and 75,000 lime seeds were sown in November for further supply. All citrus plants, however, are better suited to the hill lands, but an effort is being made to secure a trial of limes particularly in the lowlands, especially in the present plight of the coffee industry. As previously noted, a lime factory is already in operation in the district.

76. It is hoped to get some of the larger estates interested in grapefruit cultivation and arrangements have already been made to establish 10 acres at Plns. Uitvlugt and Blairmont. These substantial plots in populous centres will serve as demonstration areas to small growers and others, besides being in the nature of an experiment on lands usually associated with sugar cane cultivation.

77. The following table shows the position of the lime industry, at the end of 1930 :—

TABLE VII.

LIMES.

Years.	Acreage planted in limes.	Export of concentrated Lime juice in gallons.	Export of essential oil of limes in gallons.
1919	1,335	10,238	326
1920	1,058	6,001	484
1921	1,102	4,175	544
1922	660	11,156	634
1923	800	11,019	218
1924	711	9,785	396
1925	655	8,430	306
1926	655	4,974	277
1927	669	5,249	273
1928	660	8,124	440
1929	603	12,717	801
1930	703	11,373	660

78. *Ground Provisions.*—Plantains, bananas, corn and ground provisions are estimated to occupy 14,000 acres. This acreage is slightly greater than that of 1929 although the dry season during the latter half of the year was unusually prolonged. This increase can probably be attributed to the larger area under plantains which are being exported to the West Indies and to the fact that the slump in the coffee industry has induced many farmers to turn their attention to quick growing catch crops such as ground provisions. The Colony, as a whole, is well supplied with the staple articles of diet of the labouring population but there continues to be a shortage in peas and beans in spite of the advice in this connexion being given by the Department which is doing everything possible in the matter of seed supplies. There are here, as in other countries, periods of glut and periods of diminished supply but at no time is there very great scarcity of the main provision crops.

79. A problem very urgently deserving attention is the marketing and distribution of food crops locally and the possible export of any quantities produced in excess of local demand. Ground-nuts, soya beans, tobacco, onions, tomatoes, pulses, fibres and other economic plants continue to receive the Department's attention. The Divisional Reports contain a full account of the Department's activities in respect to these miscellaneous trials.

80. There has been a steady increasing interest in market-gardening and the demand for selected vegetable seed is growing. The sandy reef soils of the coastal areas are well adapted to garden crops and the results obtained at Sub-station Cecilia and in the home garden plots of the Bush Lot settlers bear this out. A handicap in many centres is lack of a good water supply, so essential for market gardening. Once again, the importers of seed in packets are strongly advised to consult the Department as to the vegetables and varieties which are likely to give the best results.

CENSUS RETURNS.

81. The following tables show the number of acres under cultivation in 1930 in the three counties of the Colony and also summaries for the past 13 years :—

TABLE VIII.

Counties.	Nature of Crops and number of Acres at 31st December, 1930.							
	Canes.	Rice.	Cacao.	Coffee.	Rubber.	Limes.	Coconuts.	Ground Provisions.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Berbice ...	20,896	25,370	166	200	225	500	6,922	3,354
Demerara ...	35,330	13,069	1,106	2,016	1,023	60	14,078	7,000
Essequebo ...	1,018	11,263	166	2,880	152	143	5,665	3,250
Total ...	57,244	49,702	1,438	5,096	1,400	703	26,665	13,604

TABLE IX.

	Annual Summaries of the Acreages under cultivation during the years 1913, 1918, 1919, 1920, 1921, 1922, 1923, 1924, 1925, 1926, 1927, 1928, 1929 and 1930.								
Year.	Sugar Cane.	Rice.	Coconuts.	Cacao.	Coffee.	Rubber.	Limes.	Maize, Plantains, etc., and Ground Provisions.	Total area under cultivation.
British Guiana ... 1913	72,685	33,889	14,177	1,863	3,166	4,018	941	17,580	148,319
Do ... 1918	73,565	60,432	25,882	1,997	5,158	3,981	1,351	21,959	194,325
Do .. 1919	70,876	61,200	25,882	2,147	5,125	4,042	1,335	18,192	188,999
Do .. 1920	69,532	55,246	24,453	1,816	5,052	2,813	1,058	16,583	176,853
Do ... 1921	63,420	55,911	26,321	1,176	5,030	2,813	1,102	16,378	172,151
Do .. 1922	60,761	49,073	26,603	1,371	4,241	2,333	660	12,930	157,772
Do ... 1923	57,814	34,965	22 970	1,903	4,096	2,080	800	11,924	136,552
Do ... 1924	57,190	29,406	25,201	1,918	5,765	1,655	711	14,444	136,290
Do ... 1925	57,500	29,333	29,979	1,918	6,243	2,200	655	11,715	139,543
Do ... 1926	58,589	32,798	26,502	1,287	5,226	2,000	655	14,509	141,566
Do ... 1927	59,271	37,340	27,720	1,356	5,272	1,800	669	13,855	147.353
Do .. 1928	57,625	44,359	28,000	1,202	5,894	1,600	660	15,528	154,868
Do ... 1929	57,247	52,989	28,000	1,438	5,905	1,400	603	13,577	161,159
Do ... 1930	57,244	49,702	26,665	1,438	5,096	1,400	703	13,604	155,852

COLONIZATION AND LAND SETTLEMENT.

82. All Colonization and Land Settlement matters are now dealt with entirely by the Department of Agriculture. The Bush Lot Land Settlement Scheme was completed during the year and all details in connection with its working from inception to the end of 1930 is fully dealt with in Part III. It is also being printed as a Sessional Paper.

AGRICULTURAL INVESTIGATIONS.

83. Field investigations have been carried out at the centres noted below while the work undertaken and the results so far obtained with the various crops are summarised in the reports of the officers concerned. (Part II.).

Sugar-Cane and Green Manures	—At Sophia Experimental Station, Demerara.
Do.	—At Pln. Diamond, E.B., Demerara.
Do.	—At Pln. Lusignan, E.C., Demerara.
Do.	—At Pln. Uitvlugt, W.C., Demerara.
Do.	—At Pln. Port Mourant, Berbice.
Do.	—At Pln. Blairmont, Berbice.
Do.	—At Pln. Hampton Court, Essequebo.
Rice, Ground Provisions, Pulses, Tobacco, Bananas Forage Crops, etc.	—At Demerara Experimental Stations,—Georgetown and Cecilia.
Rice, Pineapples and various food crops.	—At Henrietta Experimental Station, Essequebo.
Rice	—At Pln. Port Mourant, Berbice.
Do.	—At Pln. Rosehall, Berbice.
Do.	—At Hope, E.C., Demerara.
Coffee, Citrus and other fruits, Poison Plants, Provisions and Forage Crops, Bananas, Pineapples, Fibres, etc.	—At Hosororo Experimental Station and Sub-Station Wauna, North West District.

84. Full reference to the more important features of agricultural research connected with the major industries has been previously made in the earlier part of this report.

ENTOMOLOGICAL INVESTIGATIONS.

85. The following is a summary of the work of the Entomological Division, a detailed account of which will be found in the report of the Entomologist who was on leave during the greater part of the year.

86. As the result of recommendations made by Dr. J. G. Myers, of the Imperial Institute of Entomology, a grant has been obtained from His Majesty's Government through the Colonial Development Fund for the purpose of carrying out special investigations on the biological control of Small Moth-Borers. Mr. Cleare will be seconded for special duty and arrangements have been made for the appointment of a Supernumerary Entomologist.

87. Regulations made under the Rice Grading Ordinance have led to the commencement of an investigation on the Rice Weevil and other pests of stored paddy and rice.

88. An outbreak of the Coconut Caterpillar occurred in the Mahaicony-Abary District during the early months of the year and inflicted extensive damage in the eastern part of the District. The Division gave advice and rendered assistance in the control of the pest on the property attacked and in the adjacent villages. Smaller outbreaks of this pest occurred also in Georgetown and in the Mahaica District.

89. A small outbreak of Locusts also occurred on the East Coast, Demerara, but the damage was neither extensive nor severe. The Coconut Stem-Borer continued to receive attention during the year.

BOTANICAL AND MYCOLOGICAL INVESTIGATIONS.

90. There was no serious outbreak of any disease during the year. The long wet season, however, was a somewhat heavy one, and several diseases of minor crops occurring in July were attributable to the very wet weather prevailing.

91. As noticed in previous Reports, several diseases of the major crops of the Colony are related to environmental conditions rather than to the direct attack of organisms. Especially does this appear to be the case with the Root Disease of Sugar Cane and Wilt of Coconuts. With a view to throwing further light on these two problems, soil analyses have been carried out in affected areas by the Chemist-Ecologist, and suggestions made as to possible methods of improving soil conditions. It is hoped that one or two planters will be able to carry out some experimental work on the lines indicated, and the results will be watched with interest.

92. Investigations were carried out in connexion with the Wilt Disease of Plantains and Bananas, and plants were inoculated with several bacteria isolated from diseased suckers, and also with *Fusarium cubense*, the causal organism of Panama Disease. The inoculations have so far yielded negative results. Further work is necessary on this disease, but all observations made so far tend to support the hypothesis of Dr. Wardlaw, Banana Pathologist of the Imperial College of Tropical Agriculture, that soil conditions play a considerable part in affecting the incidence and intensity of the disease.

93. Botanical investigations included the continuation of the experiment on Plantain cultivation, and it was found that by planting suckers at the beginning of each month, a fluctuating supply of fruit could be expected throughout the year.

94. A small experimental planting of European Rice Grass *Spartina Townsendii*, was made on the foreshore of the East Coast. Its object was to see how this plant, a valuable colonizer of such areas in Europe, would compare with the local Rice Grass, *S. brasiliense*. It was found that *S. Townsendii* was only able to establish itself on a muddy area, where it was covered by every tide. It remains to be seen how it will compete with the local species.

95. Enquiries were made during the year, by persons interested, concerning the Colony's fibre crops, and especially "Crowa." Investigations were made as to the identity and distribution of this plant, which is not to be confused with the "Wild" Pineapple, though both are classified botanically as *Ananas sativus*.

96. An opportunity was afforded for the Botanist to accompany the Forestry Officers for a short time during one of their surveying expeditions. A number of plants were collected and some ecological work was carried out.

97. A collection of plants in the Jenman Herbarium has been added to as opportunity permitted, the dried specimens have been maintained in order, and a start has been made with re-conditioning them where necessary. Determinations were received during the year from the Royal Botanic Gardens, Kew, and from the New York Botanical Gardens.

CHEMICAL INVESTIGATIONS.

98. *Soil Surveys.*—During the period under review four major soil surveys were carried out.

(i.) *Plns. Bush Lot, Anna Regina, Henrietta & Richmond.*—The area surveyed consisted of some 2,400 acres of markedly acid clay traversed by a sand reef of acid sand of some 90 acres in extent. The subsoil of the area is notably saline and the defective drainage of recent years is reflected in the salinity of the topsoil.

(2.) *The Rock Island—Sapenaam Line, East Bank, Essequebo River.*—A soil survey in collaboration with the Forestry Officers was made of approximately 76 square miles of the country. Much of this area is suited to the cultivation of pine-apples and citrus. The country is unsuited to settlement by peasant proprietors until some agricultural system suited to the sandy soils has been evolved; and results from all experimental work being undertaken on similar soils at Wauna in the North West will be of great value in this connexion.

(3.) *Bartica Road.*—Soils occurring along the first six miles of the road were inspected and traverses were made from the seventh mile post. Profile pits in various forest types were sampled.

(4.) *Sophia Experiment Station.*—The area surveyed is deficient in lime, organic matter and phosphate. Field experiments designed to indicate the magnitude of the economic application of these constituents have been laid down. Attempts have been made to improve the subsoil drainage conditions.

98. *Visit of Professor Hardy.*—F. Hardy, Esq., Professor of Chemistry and Soil Science at the Imperial College of Tropical Agriculture, visited the colony in April. The principal object of his visit was to examine some typical igneous-rock soil profiles. He paid visits to a number of the sugar estates of the Colony.

99. *Advisory Visits.*—Twenty-seven advisory visits were made by the Chemist to the plantations of the Colony during the year.

100. *Examination of Samples.*—649 soil samples were collected and examined during the year. Samples of cane-juices, feeding stuffs, fertilizers, waters, pasture grasses and insecticides were examined.

101. *Cane Leaf Blight.*—Examination of soil samples from an area of canes affected by "leaf blight" on an estate of the West Coast, Berbice, indicated that the ratio of exchangeable magnesium to exchangeable calcium in the subsoils was very high. Salinity measurements on these soils did not confirm the suggestion that wilting is caused by the accumulation of *any* soluble salts in the soils.

102. *Wilt Disease of Coconuts.*—Four profile pits in affected and unaffected areas were sampled and examined; the investigation is not sufficiently advanced for conclusions to be drawn. The Department is handicapped in that it possesses no experimental area of coconuts.

103. *Forest Soil Types of the Interior.*—Eighteen profile pits have been examined and sampled in various forest types. The investigation is proceeding.

104. *General.*—Full details of the work of this division will be found in the Chemist's Report (Part II.).

AGRICULTURAL EDUCATION AND EXTENSION.

District Experimental Work and Instruction.

105. As anticipated in last year's report Divisional Agricultural Officers were appointed during the year in the counties of Essequebo, West Demerara and Berbice respectively; the Agricultural Superintendents for the North West District and East Demerara having been appointed in 1928. Details of the experimental and advisory work performed by these officers is given in their reports appended, and the most important of these may be summarised briefly as follows:—

(1.) Field Experimental work. This includes varietal and manurial experiments with sugar and rice in the different districts. In addition, under Agricultural Investigations will be found a list giving particulars of the centres and the various crops experimented with.

(2.) The organisation and distribution of seed through accredited paddy farmers, and visits to such farms for instructional work at intervals.

(3.) Collecting of statistics and investigations relating to crop economics, marketing, etc., in order to render all possible assistance to the trade to make forward sales and thereby ensuring better returns for the farmers. (The Empire Marketing Board has already arranged to send a weekly scale giving prices of exportable "tropical" products and to supply the names of buyers if and when required).

(4.) The organisation of agricultural competitions.

(5.) The organisation and inspection of school and home gardens.

(6.) Organisation work connected with the proposed district agricultural committees and other bodies.

(7.) Chairman of co-operative societies.

(8.) Attending to miscellaneous instructions from Headquarters and investigating complaints, petitions, etc.

(9.) Office work. With the exception of the Agricultural Superintendent, Essequebo, the Superintendents have no clerks.

(10.) Institution and supervision of demonstration plots.

(11.) These Agricultural Superintendents are also gazetted as rice inspectors, and the Agricultural Superintendent of Berbice is responsible for the grading of all rice that leaves New Amsterdam, whilst the Agricultural Superintendent of West Demerara is responsible for all rice that leaves Vreed-en-Hoop.

(12.) The Agricultural Superintendent for Essequebo is also employed as Settlement Officer under the Bush Lot Land Settlement Scheme in addition to his other duties, while the Agricultural Superintendent, East Demerara, is in charge of the Rice Station at Georgetown and the officer in the North West District in charge of the Station at Hosororo.

106. The value of the work of these officers will be more fully realised if the success so far obtained with cane and pure line paddy cultivation is applied throughout the Colony. Such can only be made possible by a district agricultural staff. For instance, in rice alone the value to the Colony in one year may be estimated as follows:—

Demerara Creole and Blue Stick varieties are the two pure line paddies bred and distributed by the Department. It has been clearly proved by experiment and in the field that 6 to 8 bags per acre have been obtained when using our seed or an increase of approximately 20 per cent. There is no reason why this increased yield cannot be obtained throughout the Colony but in any case, if only 2 bags per acre increase are obtained on the present acreage, the approximate value in any one year would be equal to more than twice the total vote allowed this Department. Such is the case on "one crop" alone.

107. The more important results just coming to hand from the cane experiments definitely prove that yields can be increased. For instance, the "under-drainage experiments" have given sufficiently increased yields from the plant cane crop alone to pay for the extra costs incurred. With manures it has also been found that on one estate the heavy applications of fish manure were uneconomic. These are factors of far-reaching importance and it is interesting to note that several of the estates are now applying these results. Additional experiments have been laid out on estates throughout the Colony, the principal of which are manurial and varietal. In fact, during the last two or three years the export of sugar has not decreased in spite of the large reduction in acreage. These points are dealt with more fully under the respective crops.

Co-operative Work.

108. The present co-operative bank system is considered unsatisfactory and should be replaced by societies of the smaller "unlimited" liability type. In order to institute and control such societies, a full time specialist officer with the necessary

subordinate trained staff are essential. The Divisional Officers will be called upon to collaborate in this work in their Districts and in consequence the specialist officer appointed should be attached to the Department of Agriculture.

109. My reasons for recommending the formation of such societies are as follows :—

(1.) The failure of the present system of credit banks in this Colony to provide efficiently for the needs of the small cultivators.
(2.) These Societies, as at present constituted, operate over fairly large areas and in consequence members are unknown to each other. Loans given out are, therefore, not easily controlled and this facilitates such loans being lent again, indirectly encouraging instead of discouraging the money lenders.
(3.) The success of unlimited Co-operative Societies in India and Ceylon.
(4.) Recommendations made for the formation of unlimited Co-operative Societies in Barbados by Professor C. Y. Shepherd.
(5.) All members have to make a statement declaring the value of their assets, value of properties, etc.
(6.) It places greater responsibility on its members, which a "limited" Co-operative Society does not do. Such responsibility is, in my opinion, of great moral advantage to the country and especially to the Society, as a loan asked for will only be granted after very careful scrutiny by the members of that Society. Further, the sureties, officers and fellow members would take steps to ensure that any loan given was definitely applied to the object for which it was borrowed.

110. The success of co-operation in Ceylon, for example, has been due :—

(1.) to the creation of small societies to cover small areas only ;
(2.) the careful education of its members before registration ;
(3.) intensive inspection.

Intensive education of members of proposed societies is absolutely essential to success, and by experience it has been found necessary to pay as many as four or five visits to any group of individuals asking for a society, before registration is granted.

111. Loans made by Government to a society are only granted after it has conducted its work satisfactorily and in a business-like manner over a period of at least six months and the amount that can then be borrowed is three times its paid up share capital. This rule has, however, been subject to much discussion recently and proposed alterations will probably provide for a reasonalby unlimited amount being loaned to a Society, entirely on its merits.

112. The initiation of a co-operative scheme as above proposed and recommended for this Colony can only be built up gradually and requires highly technical control.

113. *Food Crop Production and Marketing.*—The marketing of agricultural produce throughout the Colony leaves much to be desired and although markets are held regularly in the most important villages, there are no shelters or suitable accommodation provided at many of these places. In consequence, during inclement weather garden produce which is exposed for sale along the roadsides suffer depreciation, due to inadequate protection. From enquiries made, vendors would not object to paying small marketing dues if such accommodation can be provided. It may be objected to at the beginning owing to the long custom of retailing their goods without expense but the benefits to be derived from shelter accommodation is evident, as, in my opinion, the erection of such marketing sheds in the more densely populated areas would be an incentive for increased cultivation in vegetables and

fruit. Insufficient attention is also paid to packing produce for market, *e.g.*, in quakes or crates—whilst grading is practically unheard of. Produce coming from the North West District are exposed to the prevailing weather conditions before shipping, as the stelling at Kumaka has no covering whatever and further, if the steamer is delayed the farmers' plight is an unenviable one.

114. Undoubtedly, much of the food now imported can be grown in this country if proper attention and cultivation were given to the garden lands, and it is only recently through the depreciation in value of the major products of the Colony that more attention is being paid to market gardening which the Department has been steadily urging. Many of the people who are farming in this Colony have very little agricultural tradition behind them, and if other work is available they would prefer to earn a daily wage and purchase their requirements from the shops rather than produce their own crops. Many have little of the true farming spirit and this cannot be changed in a short space of time.

115. The use of imported foodstuffs is not entirely because of preference for them but chiefly from habit of purchase and the lack of knowledge of growing the crops locally. There is also the fact that the main season for rice and coffee coincides with vegetable cultivation. Coffee-growing, picking and preparation is exacting, and very little time is given to "side issues" as gardening is called, especially when the imported articles are readily obtained at the local shops. The chief imported foodstuffs are :—

Flour and Meal (Cornmeal and Oatmeal).
Salt fish.
Onions and Garlic.
Vegetables (including English and Sweet Potatoes).
Pulses (Peas, Beans and Lentils).
Butter and Butter Substitutes.
Grains.
Meats (Canned, Salted and Pickled).
Condensed Milk.
Edible Oils.

Flour may be substituted by cornflour, cassava flour, plantain or banana flour, at least partially. It must be mentioned that although these flours cannot be made into such palatable bread as wheaten flour, they are as rich in vitamins as ordinary white flour. The difficulty with cornflour is that it does not "keep" for any length of time unless kiln dried and properly stored, but could undoubtedly form part of the daily fare. The East Indians would probably prefer imported flour but the West Indians readily eat cornflour from which they make excellent dishes, "kookoo," etc.

116. *Saltfish.*—By custom, this is preferred to locally dried fish but nevertheless if dried local fish was obtained regularly in large quantities there would be a considerable decrease in the consumption of imported salt fish. As an example, when the duty on dried moricut from Venezuela was less, a considerable trade was carried on by the Venezuelans with the farmers in the North West District in dried produce at 5 to 6 cents per lb. Since the duty, however, has been raised this trade is now practically dead. Dried moricut is not as economic as salt fish but if obtained at a cheap rate this may be compensated for. The lack of good transport makes the delivery of fresh fish in the districts difficult and for this reason alone salt fish is still a necessity. Gillbacka is another fish which is a great favourite amongst labourers whilst such excellent fish as Queriman, Snook, Basha, etc., can be had in large quantities when in season.

117. *Onions and Eschallots.*—It is chiefly from ignorance of all nursery work, lack of enterprise and inattention to the cultivation of these vegetables that these

products are imported. These garden crops can be cultivated with success throughout the coastal belt especially if attention is given to growing them on raised beds, properly manured and tended.

118. *English Potatoes.*—These can, of course, be more cheaply substituted by locally grown vegetables. East Indians have a decided preference for English potatoes as they are reputed to make better curries. Jerusalem Artichoke should help to restrict the use of English potatoes and this particular vegetable can be produced fairly easily in kitchen gardens. Sweet potatoes are imported in large quantities from Barbados and these are, undoubtedly, of a more floury texture than the locally produced ones. The reason for this is evident as the soils in Barbados are more calcareous and better suited to the growing of this vegetable than the soils of British Guiana.

119. *Pulses.*—In 1930 dried peas and beans were imported into the Colony to the value of $90,005. Of the leguminous crops now grown in the Colony, there appears to be none which offers greater encouragement for extension than pigeon peas. The crop is of a semi-permanent nature; it can be used as a catch crop between orchard crops, and, if sown thickly enough, will make a very effective cover, especially when the conditions are such that a climber (*e.g.*, Bengal Beans) is not desired; under favourable conditions such vigorous growth is made that, if the plants are cut back when young and ploughed in, a serviceable green manure is obtained. In addition the demand for the peas, both for human and stock consumption, is constant.

120. Attention was drawn to this crop by the writer in "Tropical Agriculture," Volume 3, page 122, and it was stated, *inter alia*: "It is not sufficiently recognised in the tropics that leguminous forage and hays have a high mineral value and from this standpoint alone are worth cultivating as food for livestock, even though in some cases they may not yield as much bulky food as many of the grasses. In this connexion the recognition given to the pigeon pea in Hawaii is worthy of the careful attention of all stockmen in localities where this crop can be grown."

121. In Hawaii, the growth of the pigeon pea for human food is not the most important rôle of the crop in the agricultural system of the island. The plant first came into prominence as a fodder crop for cattle, especially as pasturage, but it also found favour as a soiling crop, to be topped and fed to stock out of racks. It was thus shown how palatable and nutritious the crop was for cattle, horses, mules, pigs and poultry.

122. Pigeon peas are also very much liked in Hawaii because the plants, if established, will, on account of their deep tap roots, continue growing through moderately long intervals of drought—supplying fodder—even when most of the grasses have failed. On a ranch on which pigeon peas were planted and fed to animals, it was reported that live weight gains in steers ranging from 2-2¾ lbs. per day per head had been made during a period of more than 100 days, and that annual productions had not uncommonly exceeded 500 lbs. of prime beef per acre, live weight, and in a few cases, 1,000 lbs. per acre. Not only were these returns high but the beef was of a very good quality.

123. In one 200 acre paddock two head of mature cattle per acre were supported for two years and the weights added were quite satisfactory. Since 1925 the sowing of pastures to pigeon peas in Hawaii has proceeded apace and the practice is amply justifiable, if the reputation which the crop has gained as a cattle conditioner is to be taken as a criterion; it should also be mentioned that calves running with their dams on good pigeon pea pastures can be weaned at 6-12 months without losing any weight in the transition. Comparatively little has been done with dairy cows in full milk. Nevertheless, for a period of six months, half an experimental dairy herd fed wholly on pigeon pea products yielded 8 per cent. more

milk than the other half fed wholly upon the best imported dairy feeds. The cost of producing milk where pigeon peas were fed was less than 2½ cents per pint, while the cost when imported feeds were used was over 4½ cents per pint.

124. A very important advantage which pigeon peas offer is that, in common with other leguminous crops, they have the ability to fix or utilise nitrogen from the atmosphere and by those means very considerably enrich soils in which they grow, provided the green material is returned to the soil.

125. As satisfactory as this crop is for fodder purposes, its utility for human consumption should not be lost sight of, especially as a new outlet for these peas may be expected to result from the experiments which have been carried out in shipments of tinned peas from Porto Rico.

126. A good method of utilising this plant is to establish it in hedges around garden plots where it acts as a windbreak, and is ornamental in addition to providing a very excellent food. This practice is being followed successfully on the house lots of the Bush Lot Settlement. The peas cooked with rice, sweet potato or other starchy food help to form a palatable and nourishing diet.

127. The Department having on previous occasions drawn attention to this crop, has during the last two years imported a large number of varieties. These varieties are being tried at the experiment stations, and the most promising extended with a view to obtaining seed for distribution.

128. It should also be mentioned that, at the local Government Stock Farm, highly satisfactory results have for some time been obtained with cutting back the young stems, leaves, and pods of the experimental pigeon peas' plot. This material mixed with the regular fodder grasses resulted in perceptible improvement in the condition of the animals.

129. In addition to Pigeon peas, Black Eye peas could be more generally grown. Numerous tropical varieties of other edible beans and peas are under trial by the Department with a view to extension, many of which have already been distributed.

Exhibitions and Competitions.

130. At an Exhibition held on September 8-10, by the British Guiana Workers League, the Department erected a special booth and displayed exhibits bearing on the important phases of all the major agricultural industries. There could be seen in the Department's stand :—new varieties of cane that showed promise, diagrammatic representations of the methods employed in carrying out manurial and varietal experiments, the rice grading machine and complete collections of the guide samples specified in the Rice Grading Regulations, large sized photographs, as well as living and dead specimens of the important insect pests, simply worded descriptions of the advised means of control of the serious pests and diseases, and selected animals and poultry from the Department's Stock Farm, etc. During the Exhibition, officers were on duty at the Department's stand, and endeavoured to explain all matters likely to be instructive and of interest to visitors.

131. During the period under review the following agricultural competitions were held :—

Rice.—

(1.) For the best block of not less than one acre of transplanted paddy on the West Coast, Demerara.

(2.) For the best block of not less than half an acre of pure line paddy (which was to be grown from selected seed supplied by the Department) on the East Coast, Demerara.

(3.) For the best block of not less than 1 acre of transplanted paddy on the Upper Corentyne.

(4.) For the best block of not less than half an acre of pure line paddy (which was to be grown from selected seed supplied by the Department) in Essequebo.
(5.) For the block of not less than 3 acres on the Bush Lot Land Settlement area.

Coffee.—

(1.) For the best block of pruned and drained coffee of not less than 2 acres in West Demerara.
(2.) For the best block of pruned and drained coffee of not less than 2 acres in the North West District.

Miscellaneous Crops.—

(1.) For the best block of not less than one-quarter of an acre of miscellaneous garden crops in Essequebo and on the East Bank of the Berbice River
(2.) Miscellaneous garden crops on the Bush Lot Land Settlement area.

The paddy competitions have served both to demonstrate the advantages to be obtained from the use of pure line seed and have at the same time increased the supply, while the miscellaneous crop competitions have shown the value of using selected seed and clean cultivations.

132. The awards to the prize-winners were presented by the respective members of the Legislative Council at meetings arranged for that purpose, when opportunity was taken to address the farmers present on the advantages of planting pure line seed and improved methods of cultivation. The results of these competitions were published in all the local newspapers and fuller details are given in the Agricultural Superintendents' reports.

Agricultural Associations.

133. Three Associations received affiliation grants during the year. As at present constituted they are unsatisfactory as a number of their members have very little real connections with agriculture, and recommendations for their re-organisation throughout the Colony have been submitted to Government.

134. Under the Regulations of the old Board of Agriculture, grants had been allotted at varying rates for payment to these Associations, but in view of the fact that no progress is being achieved by them, such payments cannot be considered justifiable. It is necessary that the regulations containing the affiliation requirements of these moribund bodies be cancelled and District Agricultural Committees appointed in the various districts. Each Committee should consist of five to seven of the best agriculturists in the district forming advisory bodies to the Department and controlling district agricultural activities generally, in close collaboration with the District Agricultural Officer and the Commissioner of the District if and when appointed.

135. It is imperative that each Committee should restrict its work to one district only and deal with matters within the area for which they have been formed. Their scope can be summarised as follows :—

(1.) Development of Food production.
(2.) Development of new agricultural products of export value, specially suitable to the soil of that District.
(3.) Organisation of agricultural industries of small cultivators.
(4.) Report on marketing facilities, supplies of seed, manures, etc.
(5.) Notification to the District Agricultural Officer of the outbreak of any plant pest or disease.
(6.) Assistance in the organisation of Co-operative Credit Societies.
(7.) Assistance in the organisation of agricultural shows and competitions.
(8.) Discussion of agricultural questions affecting the interests of members

136. Meetings of these District Agricultural Committee should be held regularly and the proceedings published in the Agricultural Journal for general information. It is expected that under the ægis of these Committees live district Agricultural Associations will be encouraged for the general welfare of village agriculture in the Colony.

Agricultural Courses.

137. The usual work connected with the training of apprentices has been continued at Georgetown during the period under review and during the year a number of apprentices who had finished their courses obtained satisfactory appointments. In addition to this, a course of lectures with practical classes was given by the Assistant Agricultural Superintendent of East Demerara to the Teachers of the Training Centre.

School and Home Gardens.

138. Provision has been made for the establishment of six school gardens during the coming year. Instruction is intended primarily for the older pupils who will be leaving school within the next two years, whilst younger boys and girls will receive similar instructions if it can be arranged.

139. A regular supply of vegetable seed for the first two or three seasons to all schools having gardens is desirable. Later all teachers will be expected to raise further supplies for themselves and for distribution to their pupils. In fact, the important feature of school garden work will be the encouragement to be given for the establishment of Home Gardens. Every boy will be encouraged to have a small garden of his own and in this way the seed of the best varieties of vegetables will be distributed widely, and which is of even greater importance, an agricultural bias created amongst the pupils. The Agricultural Superintendents will be in charge of this work. This approximates the 4-H Club system but is more widely spread and better suited to the needs of the Colony.

Field Days.

140. Field days for farmers have been held at the various experimental Stations during the year. It is encouraging to the staff of the Department to note that greater interest is being evinced in their experimental work and the manner in which such experiments are conducted. At these visits, which have been well represented by small farmers—at Georgetown over 180 attended—prolonged discussions have taken place and various seeds and cuttings distributed.

Overseas Exhibitions.

141. The following note which was issued during the year contains a summary of the activities in connection with overseas exhibitions for the period under review :—

> "A recent issue of the "Canadian Gazette" notes that considerable interest is being evinced throughout the Dominion, especially in the Eastern Provinces, concerning the recent announcement that Bermuda and the Caribbean Colonies will co-operate in furnishing a display of tropical products including fruits, vegetables and other trade commodities at the Nova Scotia Provincial Exhibition at Halifax this year.
>
> Visitors to the Exhibition, it is said, can anticipate a wonderful exhibit from the tropical islands lying to the south of the Maritime Provinces. It can safely be said that the appearance of the British Guiana and West Indian exhibits will be a revelation to visitors, many of whom will come from distant parts of the country as the holding of the Nova Scotia Provincial Exhibition—which is an annual affair—is regarded as an appropriate occasion for a visit to the home province.

Free space has been provided with the hope that the value of the undertaking will be amply proven. If the present project is successful, it is likely that a permanent building will be added to the exhibition plant for the sole purpose of giving the British West Indian trade territory a proper place for the display of its varied products before the world.

The Department of Agriculture associated with the Permanent Exhibitions Committee is arranging for this Colony to participate in the Nova Scotia Provincial Exhibition to be held from August 23-30, 1930, and in the Grocers' Exhibition to be held in London from September 20-26, 1930. Products such as Rice, Paddy, Timber, Coffee and Yellow Sugar are being sent forward by the s.s. "Lady Drake" on July 28, and by the s.s. "Inanda" on August 8. The exhibits will be shown to their best advantage in a setting of local fruit trees in tubs and sheaves of Paddy in straw surrounded by the well-known Kaieteur Pictures.

Twelve bags of Super quality Rice have been generously contributed by Messrs. H. B. Gajraj, Rash Beharry & Co., Booker Bros., McConnell & Co., Ltd., E. M. Walcott & Co., Sandbach, Parker & Co. and Wieting & Richter, Ltd. These will make a satisfactory display and along with samples of Parboiled Rice—comparatively new to the Canadian and English public—will be distributed useful information pointing out its advantages over White Rice and giving advice as to the most satisfactory methods of cooking.

The Colony's main industry will be represented on each occasion by samples of Yellow Crystal Grocery Sugar given by Houston sugar estate through Mr. W. S. Jones.

Coffee, one of the Colony's permanent crops, will be shown to good advantage in a fine sample of Liberian from the firm of Messrs. Garnett & Co.

The fruit trees in tubs—although primarily intended for decorative purposes—will show what can be expected from good stock. These trees have been grown—during the past year—at the Botanic Gardens, and although only six feet in height, are each bearing a nice sample of its own fruit. There are samples of Grapefruit, Orange, Lime and many others of the local varieties.

The quota from the Experiment Station consists of samples of Demerara Creole and Blue Stick paddy, of which the evenness, purity and cleanliness are guaranteed.

Timber samples from the Conservator of Forests display local woods including Greenheart, Purpleheart, Crabwood, Locust, Determa and Wamara. Explanatory notes are affixed to each sample.

The Colony is much indebted to the shipping agents, Messrs. Booker Bros., McConnell & Co., Ltd., and Curtis, Campbell & Co., for the facilities given and reductions in freight charges for the carrying of these exhibits.

The London exhibit will be handled and displayed by the West India Committee of which Sir A. E. Aspinall, C.M.G., is Secretary, while the Nova Scotia exhibits are being taken care of by Messrs. T. Geddes Grant, Halifax; to both of whom our grateful thanks and appreciation are due. In addition, a consignment of Super rice is being shipped to Halifax by certain firms will be available for sale during the Exhibition Week."

142. In addition to the above, the Department sent exhibits of various agricultural products including sugar, rice, coffee, copra, cassava, starch and tapioca to the

Canadian West Indian League for permanent exhibition at their headquarters in Montreal. Reference to these exhibitions in regard to rice propaganda is dealt with more fully in paragraph 46 *supra*.

LIVESTOCK.

143. Very little improvement—if any—in the organization of the livestock industry or progress in the establishment of pure bred herds have been made during the year. At the outset the initiation of any progressive scheme needs financial assistance, as until at such time that funds are provided for the industry, very little improvement can be expected.

144. Development can only come by the improvement of pasture, control of breeding animals, introduction of selected stock, grade herds, fencing and a properly equipped experimental livestock farm with adequately trained staff. In addition to financial assistance legislation will be necessary, as it is unlikely that peasants will take kindly to any change in the present system.

145. It is pleasing to note, however, that during the year a Cattle Owners' Association and a Poultry Association were formed. Whilst the former association can be of great help to the industry, the small farmer cannot be said to be interested in such an association.

146. The full report of the Government Veterinary Surgeon is included in Part II.

147. The returns of livestock in the Colony for 1930 are not available but those for 1929 are as follows:—

Horses	...	...	...	3,702
Asses	...	...	...	7,169
Mules	...	...	...	1,691
Horned Cattle*	...	...	...	153,639
Buffaloes	...	...	...	367
Sheep	...	...	...	26,695
Goats	...	...	...	15,825
Swine	...	...	...	22,811

BOTANIC GARDENS AND NURSERIES.

148. Abnormally heavy rains in the middle of the year were followed by four months of nearly dry weather.

149. The massing of shrubs in the beds of the Flower Garden was continued. A number of circular beds were made on the lawns and planted with annuals. The new Canna beds were made.

150. The Park Lands were kept scythed and free from bush. A new plan was made of the trees and palms in the Avenue, which include 204 species.

151. The roads, which were in a very bad state during the wet weather, were patched as far as possible, and a small heap of earth was burnt towards the end of the year to assist in their upkeep.

152. In the Nurseries, repairs were carried out on the Greenhouse, and the appearance of some of the paths improved by the spreading upon them of shell.

153. The orchid collection was attended to during the year, a number of plants being rebasketted and others set upon Wallaba blocks. The latter treatment is hoped to give a higher percentage of flowering plants. The collection was added to by at number of plants received on an exchange basis from a collection in the Panama Zone.

*Of these 72,508 were in the Hinterland Savannahs.

154. In the Economic Section attention was principally paid to the raising of Citrus seedlings for budding. Approximately 4,760 sour orange and Grapefruit seedlings were ready for budding at the end of the year. A certain number of seedlings were lost during the abnormally wet weather in the middle of the year, but after the rains the plants grew vigorously. Budding was also carried out on Rough Lemon stock and Succadee Succadens Stock. The resulting plants are being retained for the most part by the Department, until it is known how these stocks will fare under local conditions. Steps have been taken to supply the numerous orders for grafted Mangoes.

155. A collection of the more common Fish Poison plants used by the Aboriginal Indians of the Colony has been made.

156. A number of fruit trees have been planted on the Eastern side of the Nursery in order that the Gardens may have their own supplies of Citrus budwood and seeds of other fruit plants.

157. The Gardens of Government House and the Public Buildings were maintained in order during the year.

SEED AND PLANT DISTRIBUTION.

158. The following is a list of the planting material distributed locally by the Department during the year:—

Field and Garden Crops.

Sugar-cane (20 varieties) ...	... 291,648 cuttings.
Rice padi ...	...*121,510 lbs.
Bananas ...	... 448 suckers.
Papaw ...	... 20-22 ozs.
Bengal Beans ...	... 95 lbs.
Soya Beans ...	... 87 lbs.
Pulses ...	... 100 lbs.
Broom Corn...	... 20 lbs.
Millet ...	... 35 lbs.
Tobacco ...	... 2 lbs.
Onion ...	... 35 lbs.
Onion (seedlings) ...	... 10,650 seedlings.
Tomatoes (seedlings) ...	... 900 seedlings.
Sweet Potatoes (3 varieties) ...	... 950 cuttings.
Fodders (various) ...	... 14,740 cuttings.

Orchard Crops.

Coffee	... 1,429 seedlings.
Cacao	... 359 seedlings.
Sapodilla	... 149 seedlings.
Nutmeg	... 92 seedlings.
Papaw	... 118 seedlings.
Golden Apples ...	... 63 seedlings.
Grafted Mangoes ...	... 97 plants.
Budded Citrus ...	... 562 plants.
Miscellaneous fruits ...	... 403 seedlings.

SEED AND PLANT EXCHANGE.

159. During the year a number of valuable introductions were made including material of both economic and ornamental plants. Complete lists of the quantities and places of origin are given in the various numbers of the Agricultural Journal of British Guiana. I should like specially to mention the assistance given to the

* Of this amount 49,000 lbs. were grown in 10 acre blocks at Plns. Port Mourant and Rosehall, Berbice, and taken over by the Estates for distribution to their tenants.

Department by Trinidad in connexion with selected citrus budwood especially at this juncture where it is impossible for us to obtain the necessary supplies for our requirements. Contributions from the Department have been sent to:—Borneo; New York Botanical Gardens; Rhodesia; Java; Bermuda; British Honduras; Russia; Trinidad; Seychelles; Kpeve Investigational Station; Burma; Ceylon; Barbados; United States Department of Agriculture; Royal Palm Nurseries, Florida; and Antigua.

PUBLICATIONS.

160. The Agricultural Journal of British Guiana has been published quarterly and continues to have a moderately wide circulation. It has previously been pointed out that a journal such as this must cover a wide range of subjects since it has very diverse functions to perform, *e.g.*, to aid in the distribution of information to local agriculturists, to record work undertaken, together with the results and conclusions therefrom, and to be a reciprocating medium between this and other overseas agricultural departments.

161. Many of the more popular contributions were reprinted in leaflet form for free distribution. Among those which have been distributed in this way are:—"The Destruction of Coushi Ants with Carbon Bisulphide," "The Question of a Banana Industry in British Guiana," "Notes on Field Experimental Methods," "Crop Table," "Farine," "Coconut Cultivation in British Guiana," "Tung Oil."

162. In addition, "Agricultural Notes Compiled by the Department of Agriculture" have appeared periodically in the local press. Only subjects which are likely to be of local interest are thus dealt with, and the following are examples:—"Vegetable Beet Culture," "The Coconut Caterpillar," "Cassava Cultivation—the use of long cuttings," "Tapioca," "Yams," "Cover Crops," "Budding," "Poultry Rearing," "Papain," "Tomatoes."

163. The Director has made contributions to the Chamber of Commerce, to the "Montreal Daily Star" (an article on the Rice Industry of British Guiana), and published the Report of his Trade Mission to Canada in Sessional Paper 1/1930.

164. An illustrated Booklet entitled "Buy Demerara Rice" was issued by the Department, and an article—"Irrigation in the Argentine" by Mr. H. Macluskie, Agricultural Superintendent, Berbice.

AGRICULTURAL LEGISLATION.

165. The following Agricultural Legislation was brought into operation during the year:—

1. The Rice Export Grading Regulations, 1930.

It was felt that the effect of grading would encourage the general toning up of the industry and aimed specifically at stabilisation of the existing West Indian markets. Further, graded rice under Government ægis provided a hall-mark and a guarantee to the buyer, and would materially assist in extending the Colony's markets.

166. An Ordinance was accordingly drawn up and introduced to the Legislative Council by the Director and finally passed. The Governor in Council approved of the regulation coming into force as from October 1, 1930. For particulars of grades see para. 41 supra.

Mediterranean Fruit Fly Legislation, 1930.

167. In consequence of the Mediterranean Fruit Fly pest, and Order-in-Council prohibiting the importation into the Colony of *all Fruit* (with the exception of plantains, nuts, and dried, canned, candied and other preserved fruits) *and vegetables* (with the exception of onions, Irish potatoes, and canned or preserved vegetables) from all countries except the British Isles, Canada, and the British West Indies, not including Bermuda and the Bahamas, was published on May 31, 1930.

GENERAL REMARKS.

168. This is the first year since the inauguration of the new Department of Agriculture that the Department has been fully staffed in accordance with the principal recommendations under the re-organisation scheme.

169. A concentrated attack has been made on all crops and special attention is called to the results of the work obtained in connection with sugar and rice. Soil surveys are now forming part of the Department's activities and it is hoped in time to map out the country showing the districts most suitable for the various crops. Already the Rock Island-Supenaam (*vide* paragraph 97 supra would) appear to open possibilities for extension of citrus and pina-apple cultivation. At the present time, sugar and rice are the only export crops tolerant to the general environmental conditions prevailing on the coastal belt.

170. While progress has been achieved in many directions, much remains to be done to make peasant farming generally attractive and less of a gamble. Uneconomic distribution of village lands, faulty drainage and irrigation facilities are all serious hindrances to the development of village agriculture on sound and rationalised lines. It is chiefly in these directions that development should be encouraged in the future, always provided of course that there is hope of economic return from increased expenditure and maintenance charges in relation to works undertaken. In any case, little can be achieved unless villagers show greater enterprise and address themselves seriously to their problems—largely communal in nature—however willing Government and the Department of Agriculture may be to help in their solution.

171. The increase in administrative work has been particularly heavy during the year under review showing a rapid increase since 1928 the year of re-organisation. Over 3,000 items of outgoing correspondence have been dealt with compared with 685 in 1926. In addition nearly 600 Departmental files have been opened and dealt with whereas in 1926 there were less than half that number. Many lengthy investigations and progressive schemes have been reported on and submitted to Government, the more important of which are as follows :—

Sugar.—

(1.) General reports upon the position of the local sugar industry.
(2.) Observations and proposals in connection with subsidiary recommendations of the West India Sugar Commission.

Rice.—

(3.) Memorandum on the efficient distribution of pure line seed paddy.
(4.) Recommendations in regard to the adoption of Mr. Douglas' proposals as a basis for asking a grant from the Empire Marketing Board.
(5.) Résumé of conditions affecting the Rice Industry of British Guiana.
(6.) Report on Rice Cultivations in the Island of Leguan.
(7.) Reports in connection with the Grading of Rice for export.

Livestock.—

(8.) Memoranda for the organisation and development of the livestock industry of the Colony.
(9.) Livestock rearing in the coffee areas of the North West District.
(10.) Coastland cattle in the wet season.

Coffee.—

(11.) Report of the Coffee Committee appointed to consider steps to be taken to improve and assist the Coffee Industry of the Colony.
(12.) Report and recommendations respecting the Coffee Industry of the North West District.

Coconuts.—

(13.) Report of an examination of a area of coconuts at Plantation Affiance, Essequebo Coast.

(14.) Further report of examination of soils taken at Plantation Affiance.

(15.) Notes on Coconut Cultivation in the Colony.

Co-operative Reports.—

(16.) Report of the Committee appointed to study and report on the possibilities of an Agricultural Bank in British Guiana.

(17.) Comments and recommendations in connection with the scheme for the establishment of an Agricultural Loan Bank in British Guiana.

Colonization and Land Settlement.—

(18.) Report on the Agricultural Survey of the Canals Polder.

(19.) Scheme for the development of further settlement on the Anna Regina properties.

(20.) Immigration from neighbouring colonies.

Miscellaneous.—

(21.) Report on present economic position of the Colony and progress since visit of Olivier Commission.

(22.) Observations on "Memorandum on Soil Conditions in British Guiana" by Professor Hardy.

(23.) Memorandum on Agricultural Associations in the Colony.

(24.) Revision of Agricultural Section of Sir Cecil Clementi's report on the condition of the Colony during the Great War.

(25.) Observations in connection with the proposed conference in London of Directors of Agriculture.

(26.) Reports on Hills Estate Property.

172. Unfortunately this period of increased agricultural activity has coincided with a severe world crisis which finds practically all commodities being marketed below cost of production prices. This has served to detract in some measure from the work which has been inaugurated and which in many directions has already begun to yield valuable results. It is significant at any rate to note that the two leading industries—sugar and rice—have had a record year from a production and export point of view and but for the fact of prices being so low, the general economic position of the Colony would have presented a far different picture than it does at the moment.

173. With the Districts in charge of thoroughly qualified officers it will be noted that it has been found possible to give attention to a large number of questions which have never before been investigated and co-ordination of all district effort is maintained by periodical staff conferences at Headquarters. In this connection the services of the Deputy Director, fresh from Ceylon, where he had a very wide experience in district work has been extremely helpful. As much of the Director's time is taken up with administrative duties, meetings of various kinds—including those of the Legislative, Executive Councils, Chamber of Commerce, personal interviews, etc., it can readily be appreciated that the progress shown could not have been achieved without the assistance of an energetic officer fully qualified to superintend the details and execution of departmental policy. In addition to the organisation of district work, additional important activities undertaken by the Department during the year included extension of experimental work throughout the Colony, rice grading, Bush Lot Land Settlement and rice marketing propaganda.

174. The need for improved laboratory and office accommodation has now become acute, and the work of the Department is likely to be severely handicapped unless attention is given to these urgent requirements in the very near future. I must also emphasise the great need of a practical farm school run in conjunction with

the Department where farmers' sons on leaving school would receive agricultural training and from which the subordinate staff of the Department can be drawn.

175. Funds are also urgently needed for the establishment of a fully equipped livestock farm. In this connection, full recommendations have already been made and it was one of the requirements emphasised in the re-organisation scheme.

176. Imported developments having for their objective agricultural co-ordination throughout the Caribbean region were inaugurated at the Imperial College of Tropical Agriculture, Trinidad, on January 23 to 29, when Agricultural Officers of the various Caribbean Colonies met in Trinidad for full discussion of agricultural progress and policies. The proceedings of the Conference have now been published from which it will be seen the important part played by the Department at this Conference.

177. The year 1930 has been specially noteworthy for the very large number of important commercial overseas and local visitors to the Department. Further particulars of such visits are given in the Department's Journal.

178. Finally, I should like to express my very great appreciation of the loyal help given by the staff during the year. The thanks of the Department are due also to the sugar planters, mercantile community and the banks for assistance freely rendered.

J. SYDNEY DASH,
Director.

March 20, 1931.

BRITISH GUIANA.

DEPARTMENT OF AGRICULTURE.

PART II.

DIVISIONAL REPORTS.

DEPARTMENT OF AGRICULTURE.

REPORT ON THE EAST DEMERARA DIVISION FOR THE YEAR 1930.

REPORT ON THE EAST DEMERARA DIVISION DURING 1930.

Staff.

E. M. Peterkin—Agricultural Superintendent.
C. C. Dowding—Agricultural Instructor, East Coast District.
D. D. Haynes—Agricultural Instructor, Mahaica-Mahaicony District.
J. Indrobeharry—Agricultural Assistant, Experiment Station.

General.

Minor repairs which were necessary for the maintenance of the buildings have been carried out by the staff at the Station. The southern partition of the office which was badly eaten by wood-ants has been replaced, and the opportunity taken to extend and straighten this room. A water vat for drinking purposes has been erected, and two old bridges replaced with new ones the boundary fencing has been maintained in satisfactory order and a heap of earth has been burnt for the maintenance of the station roads.

2. A Rice Farmers' Day was held on Monday, September 22, at the Experiment Station, Georgetown. The attendance was most satisfactory and 180 farmers visited the plots. They were conducted in groups around the plots by the Deputy Director of Agriculture and the Agricultural Superintendent; Mr. J. D. Gillespie, Agricultural Superintendent for West Demerara, and the Agricultural Instructors for East Demerara—Messrs. Dowding and Haynes.

3. The Deputy Director lectured them on the benefits derived from growing pure seed and explained the reason for and the advantages of grading milled rice. The Director of Agriculture also addressed a full gathering of the farmers in the afternoon.

Agricultural Experiments.

Georgetown Station.

4. *Rice.*—The area under experiment in this crop was, during the period under review, 17½ acres; of this, 2½ acres were under Progeny Row plots for pure seed selection, 1 acre under a randomized varietal experiment, 2 acres under varieties selected for extension and the remainder—12 acres—under Demerara Creole for multiplication of pure seed and eventual distribution to farmers.

5. *Progeny Row Selections.*—The old established varieties, due to rigid selection, are showing marked improvement in uniformity, particularly as regards maturity, thus considerably reducing the percentage of immature grains in samples; Demerara Creole is the outstanding variety in this respect. Essequebo Blue Stick still shatters badly and matures irregularly.

6. Of the Burma rices A. 16-34 shows considerable improvement and appears to be rapidly adjusting itself to local conditions. The American rices (Carolina type) are rather disappointing, especially Blue Rose.

7. Rigid selection is being carried out with both the old and the imported varieties; single plants are selected from the progeny row plots of the previous single plant selections. The individual heads of these selections are examined in the laboratory for uniformity of size and weight of head, shape, absence of awns and for red or discoloured grains. The three most uniform individual plants of each variety are retained for planting. Each of these selections is sown in a separate nursery; at four weeks old the strongest of these seedlings are planted out singly in the beds equidistant, one foot each way; this not only provides them with ample room to develop fully but enables any volunteer seedlings to be easily spotted

and removed. Careful notes are made during their growth. All of the rice grown on the station is from individual plant selections.

8. There were 58 varieties experimented with during 1930 ; of these D. 17/88 received from Burma in 1928 had to be destroyed on account of leaf disease. The new varieties added were as under :—

From the U.S.A. —Mexican Edith and Carolina Edith, both of the ordinary Carolina type.

From Italy —Americano 1600 of the Spanish Japan type, obtained by the Deputy Director during his visit there.

From Trinidad —Kalyaman, No. 11 and No. 36 obtained and forwarded by Mr. C. E. Douglas of the Empire Marketing Board. Of these Kalyaman is of the Seta Patna type, while No. 11 and No. 36 are similar to the type received from India.

A variety called Lead Rice was presented by Mr. A. Rayman of Vreed-en-Hoop, West Bank, Demerara ; this is a semi-barley type. Mr. H. T. King, Commissioner of the North West, forwarded a variety being grown in the North West District originally from Venezuela ; this is of the ordinary Carolina type and for purposes of identification has been named Venezuela. Major Walker of the Rupununi District forwarded some seed of a rice grown there ; this is of the ordinary Carolina type and has been named Rupununi.

9. Table I. gives an idea of the period of duration, the retention of grain on the head, and the ease or otherwise with which the various varieties under experiment can be threshed ; the yields are purely tentative as they are calculated from the Progeny Row plots and not from replicated comparative test trials.

TABLE I.

Variety.	Period of growth. Sowing to reaping — Months.	Area of plot sq. feet.	Yield per acre transplanted lbs.	Degree of retaining grain on straw when reaping.	Threshes by hand.
IMPORTED VARIETIES, 1928-1930.					
Origin India.					
Basangi	4	4375	7101	Shatters freely	Very easily.
Konamani	5	2310	5223	Shatters slightly	Easily.
Ak Kullu	4½	3196	4961	Retains grain	Fairly easily.
Kristna Kata Kalu	4½	2890	3888	do.	do.
Atragada	5	1020	3074	do.	do.
A.E.B. 35	5	816	2936	do.	Easily.
Garika Sannabari	4	2450	2791	Shatters slightly	do.
A.E.B. 65	6½	816	2509	Retains grain	do.
Swarnalu	3½	2380	1921	Shatters slightly	Very easily.
Adutura No. 2	6½	1020	1281	Retains grain	Difficult.
Origin Burma.					
C 14 — 31	5	1020	4004	Shatters slightly	Easily.
A 16 — 34	5	1020	3662	do.	do.
C 19 — 26	5	1020	2904	Retains grain	Fairly easily.
B 15 — 1	5	1020	2733	do.	do.
C 15 — 10	5½	1020	2450	do.	do.
C 14 — 8	5½	272	1921	do.	do.
D 17 — 88	Destroyed	...	...	do.	do.
Origin America.					
Blue Rose (Prof.)	4	2310	1885	Retains grain	Fairly easily.
Viola	4	2100	1742	do.	Difficult.
Early Prolific Blue Rose	4	1020	1665	do.	do.
Mexican Edith	4½	816	1548	do.	do.
Calora	4	1505	1151	do.	do.
Carolina Edith	4½	1156	1130	do.	do.
Selection 300	3½	2240	1128	do.	Fairly easily.
Carolina	4	1224	1068	do.	Difficult.
Lady Wright	4	1224	961	do.	do.
Pure 1600	3½	1505	578	do.	Fairly easily.

TABLE I—(CONTINUED).

VARIETY.	Period of growth. Sowing to reaping. — MONTHS.	Area of plot sq. ft.	Yield per acre transplanted lbs.	Degree of retaining grain on straw when reaping.	Threshes by hand.
ORIGIN BRITISH HONDURAS.					
Belize River	4	1224	1743	Retains grain ...	Difficult.
Toleda District	4	1224	1352	do. ...	do.
ORIGIN HAWAII.					
China	3½	1224	2997	Retains grain ...	Fairly easily.
Japan	3½	1505	1469	do. ...	do.
ORIGIN ITALY.					
Americano 1600	3½	1505	897	Retains grain ...	Easily.
ORIGIN TRINIDAD.					
Kalyaman	4½	850	4202	Retains grain ...	Fairly easily.
No. 36	4½	136	3200	do. ...	do.
No. 11	4½	Only 10	plants grew	do. ...	do.
GROWN IN COLONY PRIOR TO 1928.					
Lead Rice	4½	1734	5242	Retains grain ...	Easily.
Hope	5–5½	2176	4423	Shatters slightly ...	do.
No. 79	5	1020	4356	do. ...	do.
H. 6	5	3230	4329	do. ...	do.
McKenzie Large	5	1224	4271	do. ...	do.
Ramcajara	5	1258	4189	do. ...	Fairly easily.
H. 7	5	2040	4185	do. ...	do.
Blue Stick	5	2040	4099	Shatters badly ...	Very easily.
McKenzie Small	5	1768	3991	Shatters slightly ...	Easily.
Chinese Barley (Esse.) ...	5	1224	3923	Retains grain ...	Difficult.
Demerara Creole	5	2040	3858	do. ...	Fairly easily.
No. 78	5	1360	3779	Shatters slightly ...	Easily.
Loumi	4½	1224	3701	Retains grain ...	Fairly easily
No. 77	5	1360	3395	Shatters slightly ...	Easily.
No. 76	5	1360	3330	do. ...	do.
No. 75	5	1360	3299	do. ...	do.
Barley (Esse.)	4½	2040	2989	Retains grain ...	Fairly easily.
Blue Rose	4	2448	2531	do. ...	do.
Blue Rose Variant ...	4½	1054	2108	do. ...	do.
Venezuela	4½	1462	2055	do. ...	do.

10. *Varietal tests.*—A randomized varietal experiment was carried out during the Autumn crop. Twelve varieties were selected, six from among old established varieties in the Colony of the Seta Patna type, four from the American Carolina type, and two from Burma. The American and Burma varieties were imported into the Colony during 1928 and 1929, and although showing improvement, have not by any means adjusted themselves generally to local conditions. The following are the varieties used:

Demerara Creole—Old established variety.
Blue Stick —Old established variety.
No. 76 —Local selection.
No. 79 —Local selection.
Carolina —U.S.A.
Lady Wright —U.S.A.
Mexican Edith —U.S.A.
C. 14–31 —Burma.
A. 16–34 —Burma.
Blue Rose —U.S.A.
H. 7 —Old established variety—local selection.
No. 75 —Old established variety—local selection.

11. The trials were laid out according to the Latin Square method, the varieties being randomised. Each plot was planted 33 feet by 6.6 feet, making 1/200th of an acre; a 2 ft. space was left between each plot.

12. The seed was soaked on May 31, sown in the nursery on June 2 and transplanted on June 30, 1930. Before transplanting each plot was demarcated with

cord, its label placed in position, and a plan made of the whole experiment. The transplanting of the 12 plots of each variety was completed before another variety was started, a single row was planted outside the boundary of each plot; these were first removed before reaping. In reaping the same procedure was followed as in planting, *i.e.*, one variety was completed before starting another. The yield of each plot was weighed down to ¼ ounces.

13. Table II. shows the yield of the varieties in order of merit.

TABLE II.

Variety.	Yield per plot in lbs.	Per cent.	Bags padi (140 lbs.) per acre.
1. H. 7	17.46	131.7	24.94
2. No. 79	16.76	126.4	23.94
3. No. 76	15.57	117.4	22 24
4. No. 75	15.48	116.8	22.11
5. Demerara Creole	15.48	116.1	22.00
6. Blue Stick	14.67	110.6	20.95
7. A. 16-34	13.29	100.2	18.99
8. C. 14-31	11.02	82.4	15.74
9. Lady Wright	10.82	81.7	15.43
10. Mexican Edith	10.51	79.3	15.01
11. Carolina	9.99	75.3	14.27
12. Blue Rose	8.12	61.2	11.66
Standard Error...	0.38	2.84	0.54
Mean of all plots	13 26	100.0	18.93

14. These are the results obtained under the particular climatic conditions occurring at the time of the experiment.

15. Inspection of the appended rainfall return for the station from June to October shows that during the early stages of growth abnormal rainfall was experienced :—

June	12·63	inches.
July	19·41	,,
August	4·45	,,
September	·68	,,
October	1·50	,,

16. It will be interesting to repeat the experiment with a few of the varieties in a season of more average climatic conditions.

17. The statistical analysis of the experiment shows that any difference in the mean yields greater than 1.62 bags of paddy per acre is due to a difference in variety. Blue Rose is the poorest yielder under the conditions of the experiment. Thus, there are no differences in yields between C. 14-31, Lady Wright, Mexican Edith and Carolina. These are better than Blue Rose, the poorest yielder of the lot, but inferior in yield to the other varieties. A. 16-34 is a heavier yielder than C. 14-31, Lady Wright, Mexican Edith, Carolina and Blue Rose. There is no significant difference in yield between Nos. 76, 75, Demerara Creole and Blue Stick. They are all superior to A. 16-34, C. 14-31, Lady Wright, Mexican Edith, Carolina and Blue Rose. There is no significant difference between H. 7 and No. 79 under the conditions of the experiment, while they are both superior to the other varieties tested.

18. *Milling tests.*—Milling tests were carried out with these twelve varieties as parboiled rice by Mr. Ramnarine Pundit at his rice mill at Albouystown with the results given in the following table :—

TABLE III.

Variety.	Weight of padi lbs.	Weight after steaming and drying, lbs.	Weight of clean rice lbs.	% of broken grains.	Colour.	* Grade.
C 14-31	100	94	69	22·7	Super ...	No. 1.
Blue Stick	100	97	69	3·9	W.G. Super...	W.G. Super.
Mexican Edith	100	95	68	9·3	Super ...	Super.
Carolina	100	96	68	12·3	Super ...	Super.
Demerara Creole ...	100	95	67	12·5	W.G. Super...	Super.
Lady Wright	100	94	65	12·0	Unsual ..	No. 1.
A 16-34	100	93	65	6·1	W.G. Super...	Super.
No. 75	100	93	65	9·1	W.G. Super...	Super.
No. 79	100	94	65	6·4	W.G. Super...	Super.
H. 7	100	93	65	8·3	W.G. Super...	Super.
No. 76	100	95	67	19.2	Super ...	No. 1.
Blue Rose	93	85	59	19·0	No. 1 ...	No. 1.

* As per schedule of Grading Ordinance.

19. *Plantains.*—The plantain experiment mentioned in the 1929 Annual Report has now been in progress for two years, and has been under the direct supervision of the Government Botanist. The following is the joint report submitted by us at the end of 1930 :—

"Fruit has been borne by the parent plants on all but the last two "beds planted (which are now bearing), and the earlier planted beds have "borne fruit from the first, and in a few cases, the second followers. The "two most successful beds were those planted in February and March, the "former having given 32 bunches of fruit from parent plants after 16 "months, and having produced 41 bunches subsequently, mostly from "followers. The March bed had produced 38 bunches from parents at the "end of 18 months, but the followers have not done so well.

"The April, May and June beds produced a small amount of fruit, "but the July to November beds, which were bearing fruit during the dry "season at the end of last year, suffered very heavy casualties from the "wind. In the dry hard soil the plants seem to have put out a very poor "root system, giving them but little anchorage. The result was that large "numbers were blown over before the fruit had begun to swell, and such "undeveloped bunches were not recorded in the lists of fruit reaped. The "following table shows the monthly yields to date, from the different "beds :—

TABLE IV.

	Jany.	Feby.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Total No. bunches.	Approx. No. from parent plants.
February bed ...	4	9	10	4	4	...	4	16	5	12	3	3	73	32
March bed ...	...	1	3	2	16	1	2	13	2	2	1	...	42	38
April bed ...	...	..	...	1	9	1	5	2	4	6	...	...	28	18
May bed ...	...	...	...	...	1	6	4	2	2	10	1	...	26	25
June bed ...	...	...	...	...	...	...	...	25	4	3	3	...	35	...‡
July bed ...	...	..	...	...	...	...	...	...	...	...	2	...	2	...
August bed ...	...	...	...	...	...	...	..	...	...	4	5	...	9	...
September bed ...	...	...	...	...	.	...	...	...	3	15	2	...	20	...
October bed ...	...	...	...	...	...	...	...	...	1	3	6	...	10	...
November bed ...	...	...	...	...	...	...	...	...	...	1	3	...	4	...
*December bed ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
*January bed ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total bunches reaped per month ...	4	10	13	7	30	8	15	58†	21	56†	26	3	...	...

* Not yet reaped.

† A considerable number of plants were blown down in August and October. Hence the large number of bunches recorded for these months.

‡ No followers have yet borne fruit from the June and later beds. Some bunches were lost by wind.

"The weight of each bunch reaped and the number of hands were "recorded. The weights, however, are no criterion, as many even of the "bunches reaped were from plants blown down, the fruits of which were

"not mature. The following table shows the relative proportion of bunches "of different sizes :—

TABLE V.

Beds.	4 hands.	5 hands.	6 hands.	7 hands.	8 hands.
February ...	3	9	17	34	10
March ...	...	2	22	17	1
April ..	1	5	14	6	2
May ...	1	5	14	6	...
June ...	1	3	9	22	...
July ..	...	...	1	...	1
August ...	...	4	1	3	1
September ...	...	5	7	4	4
October ...	...	1	2	5	2
November ..	...	1	1	2	...
December ...	...	...	...	...	...
January ...	...	...	...	...	...
Totals ...	6	35	88	99	21

"The 'Bulb' suckers bear fruit in the case of the parent plants, some- "what earlier than the 'Swords.' The period necessary for the parent "suckers to produce mature fruit varied from 13 to 18 months, the beds "planted during the wet season being especially tardy. In the March bed "the differences in the maturation periods for fruit from 'bulk' and "'sword' suckers was clearly marked, the majority of the former being "reaped after 15 months and the latter after 18 months.

"In the February bed the time elapsing between the reaping of fruit "from the parent suckers and from the first followers was approximately "6 months.

"The plantain beds have been inspected regularly at intervals of "1 month to 6 weeks, and notes taken as to the development of each plant, "*i.e.*, whether parent, first, or second follower, size, and whether flowering "or maturing fruit, etc. From these notes, rather than from the record of "bunches harvested, it appears that if the plants had been able to "mature their fruit, without such a large number being blown over, there "would have been a fluctuating quantity available throughout the year.

"It may be noted here that Pln. Hope, East Coast, where plantains "are grown on a large scale, gives ample demonstration of the possibility "of producing a regular supply of plantains throughout the greater part "of the year, by variation of planting time and the amount of weeding "and cultivation given.

"The present condition of the plantain beds at the Experiment Station "is, however, very bad. They are bare, windswept, and stunted in "appearance, and the number of plants blown over recently has been "especially large. This being the case, and the objects of the experiment "having been vitiated by this and earlier wind damage, it is suggested "that it now be abandoned. The soil appears to be of the poorest nature, "and it seems doubtful whether better, or more significant results could "ever be obtained from this area as it is at present.

"The February bed, as the best, might perhaps be retained for a "while longer, to note whether the yields are maintained."

20. *Bananas.*—These have done fairly well; the best varieties have been extended, and a large number of suckers distributed.

21. *Pigeon Peas.*—This collection has been increased during the year by fourteen varieties from Trinidad, nine varieties from Porto Rico, and one from Madras,

India ; most of these are growing well. Of those from Porto Rico six were duplicates of varieties already supplied from Trinidad. Some of the new varieties have started to flower. The varieties under cultivation at present are :—

Barbados—large grey seeded.
Local —small grey seeded.
Local —small brown seeded.
New Era.
Silvios.
Americanos.
Negros.
Dominica 813.
Larcenos 4446.
Cadios.
Acebenos 4447.
Acebenos 4448.
San Salvador.
Manchados.
Horacios.
Mites, New Era strain X, New Era Strain D. and Indian Pea.

22. *Beans and Peas.*—Extension of the above has been continued and the most promising varieties of these are :—

Bush Bonavist.
Bonavist (Vine.)
" Henderson's Bush Lima Leviathan."
Waby Bean.
A French Bean brought out by Mr. Macluskie, Agricultural Superintendent, Berbice.
Wax Bean.
Yard Bean.
Butter Bean.

23. *Sorghum* (*Namudzi*).—A few farmers have been induced to try this crop but it is very difficult to create an interest in it.

24. *Onions.*—A nursery was devoted to growing onions and a large number of seedlings were grown and distributed to farmers.

25. *Tobacco.*—The demand for tobacco seed has increased during 1930 but the long dry season during the end of the year caused severe loss and has somewhat discouraged cultivators. To most farmers it is a new crop ; they attempt to grow more than they can properly attend to, and then discover that caterpillars have ruined most of the leaves. The undermentioned varieties were grown for seed :—

Comstock Spanish.
Yellow Mammoth.
Vaughan's White Burley
Kentucky One Sucker.
Hickory Prior.
Rupununi.
Superior Type } from the Azores.
Common Type }

26. *Sweet Potatoes.*—The following varieties were imported and are making good progress:—

From Trinidad —Black Sam.
Black Rock.
Red Nut.
From Barbados —Six weeks.
Red Nut.
Trinidadian.
Carolina Lea.
From Australia —Brook's Gem.
From St. Vincent—V. 52.
From Philippines —Philippine No. 3.

27. *Manilla Hemp.*—Twelve suckers were obtained from St. Vincent in July, these are growing and suckering freely.

Fodder Crops.

28. *Wynne Grass.*—An effort was made during 1929 to establish this, but without success. During 1930 six rootstocks with soil were obtained from the North West District and established without difficulty. These have since made very vigorous growth.

29. *Guatemala Grass.*—Some rootstocks were obtained from Trinidad and planted in two rows across a 2½ rod bed on February 4, 1930; these when cut, on July 31, weighed 174 lbs. There was also a great demand for cuttings of Uba Cane Elephant Grass and Demerara Primrose.

30. *Green Dressings.*—Estate Managers and farmers have displayed considerable interest in green manures. The following are being grown at the station and a limited quantity of seed is available for distribution:—

Crotalaria Sericea.
„ Usaramoensis.
„ (unknown variety).
„ Juncia.
„ Striata.
„ Quinquifolia.
„ Retusa.
Wooly Pyrol.
Black creeping Gram (Phaseolus Mungo. var radiatus).
Troit Cowpea.
Victor Cowpea.
Conch Cowpea.
Indigofera Hirsuta.
Indigofera (unknown variety introduced from Essequebo).
Tephrosia Hookeriana.
Dolichos Lablab.
Dolichos Hosei.
Bush Bonavist.
Yokohama (Stizolobium Deeringianum).
Arlington (Stizolobium Niveum).
46448 (Stizolobium sp.)
Stizolobium aterrinum.
Canavalia Ensiformis (White seeded).
„ Cladiate (Pink seeded).
„ sp. (Red seeded).
Centrosema pubescens.
Desmodium Tortuosum.
Phaseolus semi erectus.
Sesbania sericea.

31. *Orchard Trees.*—The fruit dam has been pruned, bird-vine and scale insects removed and treated where required.

32. The new area in mangoes is making satisfactory progress.

33. *Mangoes.*—The following are particulars of varieties planted out in the new area to date:—

26 Julie.
1 Gordon.
3 Mrs. White.
3 Jamaica No. 11.
1 Mrs. Dare.
2 Graham.
3 Pere Louis.
3 Black Bombay.

The following are the varieties growing on the old fruit dam:—

Jamaica No. 11.
Rowland.
Julie.
Madam.
Canal No. 1.
Mrs. Clementi.
Egerton.
Chinoise.
Baroomashay.
Bangalore.
Ceylon.

Seed Distribution.

34. Plants, cuttings and seeds of field crops were distributed during the period under review to farmers and others throughout the Colony as given in the following summary:—

Paddy ...	... 62,360 lbs.
Namudzi-Millet	... 35 lbs.
Soya Beans ...	... 87 lbs.
Bengal Beans ...	... 95 lbs.
Pigeon Peas ...	... 20 lbs.
Broom Corn ...	... 20 lbs.
Mung ...	... 50 lbs.
Tobacco ...	... 2 lbs.
Papaw ...	... 20-22 ozs.
Onion seedlings...	... 10,650
Tomato seedlings	... 900

Fodder Crops.—

Demerara Primrose	... 7,570 plants and cuttings.
Elephant Grass	... 6,670 plants and cuttings.
Uba Cane ...	... 500 cuttings.

and considerable quantities of seed and seedlings of vegetables, beans, peas, etc., not only to farmers and others in the East Demerara District, but to the settlers at Bush Lot, Essequebo. The demand this year was greater than 1929.

Pests and Diseases.

35. The weed "*Sphenoclea Zeylancia*" was very prevalent during the year, especially in the North-east Field; in some cases it required four weedings to keep it under control. This weed is confined to drains and rice beds; deprived of water the plants flower and fruit when only a few inches high, the normal height being 2ft. 6ins.; it seeds very profusely.

36. Birds have done a considerable amount of damage; the rice on the Station is planted earlier and heads earlier than the neighbouring crops on the East Coast area, consequently all the birds in the District are attracted to the station. Boys are employed to scare them away, but this is an expensive method and not wholly satisfactory.

37. Man Rice was not as prevalent as usual. The damage done by the paddy bug and caterpillars was slight.

Agricultural Competitions.

38. Two rice farmers' competitions were run in the East Demerara District, one at Plu. Hope, Lower East Coast, Demerara, and one in the Mahaicony District. The variety of paddy used was Demerara Creole and pure seed was supplied from the Georgetown Station to all entrants free of cost. The area of each competitor's plot was half an acre. The seed was sown in the nursery at the rate of 17 lbs. to 3 square rods, and when transplanted at 4 to 5 weeks old at the rate of 2 to 3 plants to the clump. Heavy rainfall in June and July did much damage to the nurseries, while excessive dry weather during the fruiting and ripening periods affected the yields materially in the Mahaicony District.

39 The Competition plots in both districts yielded considerably more than the surrounding areas; this was due to better cultivation as well as better seed. Competitors who failed to carry out the Department's instructions were disqualified. A list of the prize-winners with the yields of paddy obtained is given below :—

Plantation Hope.		Return per acre—bags of 140 lbs.
1st prize—Hoosain Bacchus	...	42
2nd prize—Rampersaud	...	40
3rd prize—Abdoola	...	40
Mahaicony.		
1st prize—J. A. Williams	...	20
2nd prize—P. H. Garrett	...	20
3rd prize—C. Fraser	...	17

40. These competitions have aroused a great deal of interest and the demand for pure seed is in excess of the supply.

41. All paddy sold or distributed in the East Demerara Division is followed up by the Instructors in the District and carefully watched to see how it compares with the local varieties; in every instance the difference in growth and yield, more particularly its uniformity of ripening, was very marked and quite apparent even to the uninitiated. It is very difficult to obtain accurate data as regards yields from the small cultivator, but the demand for pure seed is most encouraging.

Sub-Station Cecilia.

General.

42. This sub-station was used principally during 1930 for growing legumes for seed distribution, also onion and tomato seedlings for free distribution to selected farmers in the District. Due, however, to the protracted drought towards the end of the year the farmers could not avail themselves of these supplies to the same extent as was expected, and when the rains eventually came the bulk of the seedlings were too far advanced for transpl anting. To keep them alive water had to be transported in barrels from the Golden Grove well.

Agricultural Experiments.

43. *Soya Beans.*—Experimental plots of soya beans have been grown during the year, but, after repeated trials during the last three years when promise and despair have given place to each other in turn, there is no alternative but to regard the crop as an unsatisfactory one under local conditions. Continuous rain affects

the crop adversely; the plot of 125 square rods planted in April showed signs of great promise but the rains in June and July destroyed practically the entire crop, only 26 lbs. of good seed being obtained from the whole area.

44. *Pineapples.*—The following varieties are under cultivation :—

Red Spanish.
Black Antigua.
Chocoma.
Sugar Loaf.
Red or Brown Montserrat.
Maipouri.
Buck.
Bush.
Baby.

Three hundred and twenty-two suckers obtained from these were forwarded to Henrietta Station, Essequebo.

45. *Peanuts.*—The cultivation of this crop has been discontinued; seed of Spanish, Virginia Bunch, Basse and Exotic, has been sent to the Essequebo Station.

46. *Legumes.*—The following varieties have been planted for the purpose of distribution of seed in the district :—

Stizolobium Aterrinum.
Yokohama Stizolobium.
Arlington Stizolobium.
Canavalia Gladiata.
Dolichos Lablab.
Dwarf Bonavist.
Lima Beans.
Pigeon Peas.
Cow Pea.

During the year 325 adults and 246 school children visited the station.

MISCELLANEOUS.

47. *Revenue.*—The revenue for the year 1930 was made up as under :—

Georgetown Experiment Station...	...	$ 652 92
Sub-Station Cecilia, East Coast ...	...	52 93
		$ 705 85

E. M. PETERKIN,
Agricultural Superintendent.

DEPARTMENT OF AGRICULTURE.

REPORT ON THE NORTH WEST DIVISION FOR THE YEAR 1930.

REPORT ON THE NORTH WEST DISTRICT FOR THE YEAR 1930.

Staff.

E. Beckett, F.L.S.—Agricultural Superintendent.
L. McKinnon —Foreman.

General.

Throughout the year regular visits to the farms, which are dispersed over a wide area, were continued; in the course of these visits it was found possible to inspect the cultivations in the Yarakita, Arakaka and Moruca districts and the Mission Stations at Kevelbanneh and Warapoko in the upper Waini. Investigations of both hill and pegasse soils have been made and reported upon.

Agricultural Experiments—Hosororo.

A.—pegasse lands.

2. *Coffee.*—The area devoted to experiments with coffee has been maintained. Ten acres are under Liberian and 5 acres under de Weveri, Robusta and Stenophylla. Observations are also being carried out with mixed varieties—C. de Weveri, C. Uganda, C. Quillota, C. Camphora, Klani-Pierre, C. Albeicuta. Seven acres of this area were interplanted in 1928 with Gros Michel bananas and a small acreage of Giant Fig bananas was established during the year. The endemic fungus disease (*Sclerotium cofeicolum Stahel*) was less in evidence than in 1929, and in 1929 the attack was less severe than 1928. No spraying was carried out during the year.

3. The depression in the coffee market very profoundly affected the financial condition of farmers throughout the district, who, being almost entirely dependent on a single crop, found the amount of money in circulation greatly restricted as soon as the prices fell below the cost of production.

4. The situation was regarded so seriously by Government that a Commission was appointed, with the Director of Agriculture as Chairman, with the following terms of reference—"To consider what steps should be taken to improve and assist the coffee industry of the Colony, both in regard to local and foreign markets."

5. A report with recommendations has since been presented to Government. The general agricultural system adopted in the district is that ground provisions are first planted in the pegasse soils. Between the provisions, coffee seedlings are introduced (about 12 feet x 12 feet apart). After a few crops the short-lived pegasse ceases to give profitable returns of provision crops and attention is then largely restricted to coffee. Thus there is a marked tendency for the farmer to continue "taking in" new lands and the average coffee farm is in consequence normally too extensive in area to be operated efficiently by the Settler and his family. It is for additional labour which has to be employed that loans are normally made and it is thus that the industry has been built up largely on a system of credit. The creditors being almost invariably the local shopkeepers.

6. There are considerable areas of fertile pegasse fringing the river banks which are unoccupied but it must be pointed out that there also exist areas which support vegetation of the type of white cedar (*Tabebnia* sp. Gomez) and swamp lily (*Hymenocallis* sp. Salisb) and which are notoriously infertile. There is so little exact knowledge on the ecological relationship of these pegasse soils to crop growth that it is patent that much laboratory work, in conjunction with field experiments, will have to be undertaken.

7. *Bananas.*—The experiment with bananas was continued and closed during this year.

Planting was carried out in May, 1928.
Flowers were first seen in March, 1929.
Reaping was first started in June, 1929.

The first reaping gave the following results :—

Number of bunches.	Number of "hands."
1	12
1	11
13	10
54	9
120	8
256	7
221	6
71	5
10	4
747	

The average weight was 35.6 lbs., roughly 25 per cent. were "count" bunches and 64 per cent. 6 and 7 "hands."

8. At the second reaping 345 bunches were made up as under :—

Number of bunches.	Number of "hands."
3	10
10	9
31	8
87	7
119	6
72	5
22	4
1	3

with an average weight of 26 lbs. per bunch and only 44 "count" bunches out of 345 (*i.e.*, approximately 13%).

9. The third reaping consisting of ratoons resulted as under :—

Number of bunches.	Number of "hands."
5	10
7	9
27	8
48	7
58	6
22	5
4	4
171	

The average weight per bunch was 27.7 lbs.—the heaviest being 70 lbs.

10. Giant Fig was even more unsatisfactory, the yield from the small area being :—

Number of bunches.	Number of "hands."
4	8
9	7
14	6
2	4
29	

11. The total expenditure was $148.40 made up as follows :—

Collecting, selecting and transporting suckers ...	$	12 39
Planting		17 06
Cultivation and pruning		38 12
Cutting stakes, tie ropes and staking ...		50 54
Reaping		30 29
	$	148 40

The total receipts were $136.55.

12. It is important to note that the pegasse on which the experiment was carried out was not of the virgin type but had previously been cropped and had in previous years supported rubber and other crop plants. It will be seen therefore that as a commercial enterprise the older pegasse soils are not suitable for profitable banana cultivation.

13. On July 13, there were very strong winds which overthrew several forest and para rubber trees and devastated the banana fields, in spite of the careful staking of the stems. Staking, as may be seen from the above statement of expenditure, is an expensive item but is essential in the loose pegasse soils.

14. *Cassava.*—Experiments with this crop were continued, the plant being used as a weed control.

15. *Fibre.*—Suckers of crowa fibre to the number of 100 were planted in 1929 in the area between the coffee trees, but have made (unlike those on the hill lands) poor growth. A stool of *Bochmeria*, the celebrated fibre cultivated in China for the well-known silky fibre, " China Grass " was found growing on the pegasse and from it plants were obtained, and beds for extension purposes planted.

16. *Ground Provisions, etc.*—Owing to the combination of the coffee and banana experiment, no work was carried out on the pegasse area at the station with ground provisions. Excellent provisions of yams, tannias, eddoes and sweet potatoes, etc., were produced by various farmers. One or two farmers are still attempting to grow Soya beans on the sandy and lateritic hill soils, with some measure of success, the flats not proving suitable.

B.—LATERITIC AND SANDY HILL LANDS.

17. *Limes.*—Interest in the possibilities of the hill lands is being aroused. One planter (Mr. H. J. Sampson) has obtained 650 acres of hill lands (with a small area of flat pegasse) and is prepared to grow limes and other citrus plants on a large scale and to make extensive trials with cacao, coconuts, avocado pears and catch crops. His lime factory which deals with 70 acres of established limes leased from Mr. E. Chan-a-Sue, has operated during the year—concentrated lime juice, distilled oil of limes and hand-pressed oil having been manufactured.

18. The old lime cultivation at the Station was maintained in satisfactory condition during the year. The extension of 5 acres (2½ budded and 2½ seedlings) planted in August, 1929, has made excellent growth—all the trees are free from disease.

19. At the end of the year 1,000 budded lime plants were on hand at the Station—all of these have been applied for by Mr. Sampson. A hundred budded lime plants were sent to the Bush Lot Settlement Scheme, Essequebo. A portion of pegasse has been empoldered and 75,000 lime seeds were sown in November with a view to further extension of the industry in the district.

20. Many of the smaller farmers are contemplating the planting of limes, so that if the market holds (and with the recent lamentable disaster in Dominica, this

may be the case) the areas planted with limes in this district should increase within a very short time.

21. *Other Citrus.*—It is interesting to note that the class formed in May to learn budding has progressed satisfactorily and budding of limes and other citrus is now a matter of routine. The position in this respect, at the end of the year was as follows :—

Budded Marsh Grapefruit	...	175	plants (imported budwood).
,, Duncan ,,	...	59	,, ,, ,,
,, Oranges—Parson Brown ..		14	,, ,, ,,
,, ,, Navel	...	19	,, ,, ,,
,, ,, Valencia	...	19	,, ,, ,,
,, ,, Dancy Tangerine		12	,, ,, ,,
,, Limes	...	1,000	,, Budwood from selected lime trees at Station.
		1,298	

Stock ready for budding in February, 1931	...	...	1,594
,, ,, ,, ,, ,, June, 1931		...	5,137
Seeds just germinating	...	...	3,471
Delivered to Bush Lot Land Settlement Scheme and elsewhere, budded limes	...	...	103
Budded citrus fruit (local)	...	...	5
			10,310

Total 11,608.

22. During February, 198 imported buds of the following oranges were received and given to the late Mr. P. C. Pierre for budding on the stock grown by him at Wauna. The budding was carried out on February 12 by labour furnished from this Station with the following results :—

	Number and name of plants budded February 12, 1930.	Results.
Jaffa ...	24	21
Parson Brown ...	29	26
Pineapple ...	18	12
Valencia ...	19	18
Ruby ...	62	62
Navel ...	46	36
	198	175

These were planted out in the fields during the year. During this year, there has been an extension of limes on the hill lands. Apart from the stocks on hand enumerated above, the cultivation of budded citrus fruit growing at the Station has been satisfactory during the year and good growth has been made.

23. Coushi Ants *(Atta cephalotes)* and *(A. octospina)* are still a menace, the latter species especially. The control of this pest will have to be systematically undertaken if citrus fruit is to be grown on a commercial basis.

24. *Cacao.*—Cacao can be grown satisfactorily on some of the hills but it appears to be inadvisable to plant this crop on pegasse. This cultivation is gradually attracting notice and there has been an increase in the area planted in this district on the lateritic hill slopes of the Wanaina and Arukamai hills. At the Station, the historical cacao referred to last year (Agric. Journ of British Guiana,

Vol. II., No. 2, page 76) continues to make satisfactory progress. At Arakaka some very good Caracas type of cacao may be seen and good growth is made on certain areas in the district. There has been a continued demand for young cacao plants during the year.

25. *Poison Plants.*—In connection with poison plants of insecticidal value considerable activity has taken place. The British Empire Marketing Board is financing the experiments started at the Hosororo Station and sub-station Wauna. During the year, considerable quantities of cuttings of Black and White Haiari (*Lonchocarpus* sp.) as well as Yaraconalli (*Tephrosia toxicaria*) seeds have been collected—sufficient to plant 6 acres at Hosororo and 6 acres at Wauna. At Hosororo there is already an area devoted to the following poison plants—Black and White Haiari (*Lonchocarpus* sp.), Yaraconalli (*Tephrosia toxicaria*), Konami (*Clibadium surinamense*), Konoparu (*Euphorbia cotinoides*) and Dukanani (*Phyllanthus conami*). Both the Black and White Haiaris (as was the case in 1929) were severely attacked by some fly forwarded to the Entomologist for identification, which has considerably retarded their growth. The attack from this pest has not been noticed on Haiari growing at Wauna nor on the Haiari growing in the forest. Very valuable data will be available in the future.

26. *Forage Plants.*—Demerara Primrose has been proved by the feeding trials at the Stock Farm, Georgetown, to be a valuable pig and cattle food and in consequence it is being extended in this district. Uba Cane, Elephant Grass (*Pennisetum* sp.), Wynne or Molasses grass (*Melinis minutiflora*) have been distributed from the Station to various farmers. Wynne grass has been sent to the Rupununi, etc. The Chemist-Ecologist also secured specimens of this grass with a view to ascertaining its food value whilst the Government Veterinary Surgeon was furnished in November with fresh grass to test its feeding value at the Stock Farm. The growth of this grass is so rampant as to suggest its possibility of becoming a pest. It flourishes on the laterite hill soils as well as on the hills with sandy soils of which Wauna sub-station is typical; even on sandy soil drought conditions do not hamper its growth.

27. *Other Economic Plants.*—The grafted and budded avocado pears at the Station are making very satisfactory progress and farmers owning suitable hill lands would be well advised to turn their attention to this fruit crop.

28. Already Florida realises the value of avocadoes in relation to citrus so the fact that this does well on our lateritic hill lands should be taken advantage of by farmers of this district.

29. The few nutmeg grafts planted at the Station are growing but the growth of cinnamon is not very encouraging—the soil where they have been planted being too gravelly.

30. Three trees of *Hydrocarpus anthelminta* planted on January 10, are making good growth whilst 6 plants of Neem (*Azadirachta indica* Juss.) planted on February 28, are a source of interest to East Indian visitors.

31. British Honduras Mahogany has been utilised as a windbreak and a further 400 trees were planted in December. The growth made by the 300 Mahogany planted in June, 1929, has been excellent—unfortunately, they have been attacked this year by the larvae of a pest which is still under observation by the Entomological Division.

32. *Fibres.*—During the year, fibre plants have received attention. Several hundred suckers of Crowa (*Ananas sativus* vars.) have been planted—there are at least 3 varieties all of which are represented in this collection. The experiment with *Malachra capitata* is being continued. Plants of Boehmeria were ready for extension at the end of the year, whilst *Sansevieria Zeylanca* Wild. (Bow-string hemp) have been also established in the nurseries.

33. *Soil Erosion.*—Farmers having seen the results of soil erosion and the steps taken to combat it at this Station appear now to be convinced of the necessity for conservation of the humus and prevention of soil wash by means of contour drains; the importance of conservation of this type has been persistently stressed.

34. *Maize and Yams.*—In May, 1929, 3 acres of maize were planted on the hill side of the Station and reaped in October, when only six bags to the acre were obtained. Half an acre of this area was then replanted late in October and reaped in April, 1930, yielding at the rate of 18 bags to the acre. Farmers here repeatedly state that the second crop of maize on the hill soils is invariably far superior to the first crop. The reverse is the case on "pegasse" land. The average yield of maize in the district is 10 bags to the acre.

35. Half an acre of yams planted on the hill in May, 1929, was reaped in March, 1930—yielding at the rate of 10,952 lbs. to the acre; on the rather poor pegasse land at the Station the averarge yield was 10,967 lbs. On virgin pegasse considerably greater yields are frequently obtained, *e.g.*, 30,000 lbs. per acre.

36. Three acres of hill land at the Station were cleared, holed and prepared for extension of budded citrus; this area has not yet been planted, being kept for plants budded on stocks of Trinidad sour oranges, rough lemon and grapefruit. Another acre has been planted in yams with a view to securing further data in regard to staking, preliminary reports being made in 1929.

37. *Pineapples.*—The Red Spanish planted on April 25, 1928, fruited freely in May, 1930, whilst the Smooth Cayenne planted on May 6, 1929, fruited in May, 1930. The Smooth Cayenne suffered from wilt. The site is not suitable and suckers as available are being extended under more favourable conditions. All the pineapples in the district, including those grown on the Station with the exception of the variety known locally as "Tiger Head," were attacked by a fungus this year. Externally the fruit appears normal but on being cut shows dark brownish or blackish blotches in the flesh—the discoloration and rot extending to varying depths. Specimens were forwarded to the Government Mycologist.

Wauna Sub-Station.

38. Six acres have been prepared for experiments in Haiari (*Tephrosia toxicaria*). One acre is under Coffee Arabica and Wynne grass. Molasses grass is well established.

Diseases and Pests.

39. Apart from the disease of pineapples referred to above, and the endemic disease of Liberian coffee (*Sclerotium coffeicolum* Stahel) and a wilt disease affecting tomatoes, no other disease caused any trouble during the year. With respect to pests, the British Honduras Mahogany suffered severely from the damage caused by certain larvæ *Hypsipyla* species (undetermined) especially during June and July. Haiari plants were attacked by some dipterous insect, while the young shoots of budded citrus were considerably damaged by saw-flies.

40. The looper caterpillar and cabbage "worm" severely damaged the cabbages the farmers were attempting to grow. Coushi ants as usual gave trouble but the situation is well in hand at the Station. The cockle pest was not much in evidence this year though there were complaints of this pest during May.

Distribution of Seeds and Plants.

41. The Station distributed large quantities of sour orange, grapefruit, Tonka beans (*Dipteryx odorata*) and locust seeds (*Hymenaea courbaril*) also limes, cacao, Uba Cane, Elephant Grass, (*Pennisetum sp.*), Wynne or Molasses grass (*Melinis minutiflora*), seedling avocadoes (*Persea gratissima*), sweet potato cuttings and 103 budded lime plants and 5 budded grapefruit, pineapple suckers, Jamaica ginger and turmeric (*Curcuma longa* L.). For the Exhibition of the British Guiana Workers' League held in Georgetown in September, yams, tannias, Liberian and camphora

coffee, tapioca, tonka beans, distilled oil and hand-pressed oil of limes, concentrated and raw lime juice and Crowa fibre from the North West were displayed.

Field Competitions.

42. A field competition for the best kept coffee (drainage being stressed) was successfully carried out during the year. The prizes were distributed by the Commissioner at the Mabaruma Court House on December 5. There is no doubt but that these competitions serve a very useful purpose in this district.

Miscellaneous.

43. Beds of *Gliricidia maculata* (wind belt and shade tree), and cover crops were established in nurseries. A few plants of Tung Oil (*Aleurites Fordii*) have been raised for the Wauna Station and several Tonka plants for planting and supplying the "spice" area at Hosororo.

44. *Census.*—The census figures for 1930 are as follows :—

	Rice. Acres.	Sugar. Acres.	Coconuts. Acres.	Rubber. Acres.	Coffee. Acres.	Cacao. Acres.	Limes. Acres.	Maize, Cassava, Plantains, Bananas, Ground Provisions. Acres.	Tobacco. Acres.	Totals. Acres.
Barima ...	...	¼	11½	...	660⅝	5½	...	335	...	1,013
Waini ...	...	...	7½	...	31¾	...	..	38	..	77¼
Mora Passage ...	...	...	½	...	26	¼	...	14	...	40¾
Mabaruma ...	...	...	2½	..	18¼	12¼	70	20	...	123
Aruka River ...	...	...	14½	...	892	5	10	289¼	...	1,210⅜
Koriabo ...	...	5	9	...	435	41¼	...	208½	...	698¾
Kaituma ...	...	...	...	...	38½	...	...	7½	...	46
Imbotero ...	...	...	14	...	133	...	...	143¼	...	290¼
Arukamai ...	...	...	4	...	...	9	...	...	...	13
Arakaka ...	...	3½	...	...	...	16	...	16	...	35½
Moruca ...	...	...	84	...	17	...	...	12	...	113
	...	8¾	147½	...	2,252½	89¼	80	1,083½	...	3,661¼

45. *Stock.*—A good deal of advisory work has been done in connection with stock. Turkeys and poultry generally thrive well both on the hills and on the flats. The question of pig rearing and cattle raising is receiving attention; pork is sold locally in the district at 20 cents per lb. and beef at 16 cents per lb.

46. *Visitors.*—It is a pleasure to be able to report that visits from farmers to the Station have been much more frequent this year than previous years.

47. *Weather.*—The rainfall for the year has been as follows :—

	Ins.	Parts.		Ins.	Parts.
January ...	9	.15	July ...	17	.63
February ...	4	.07	August ...	5	.48
March ...	1	.85	September ...	6	.42
April ...	8	.40	October ...	4	.93
May ...	7	.34	November ...	2	.66
June ...	13	.24	December ...	9	.84

In spite of the failure of the rains at the end of the year due to the moisture laden atmosphere, plant life suffered very little, if at all.

48. *Reports.*—The following reports were submitted to the Director during the year :—

(1.) Answers to Questionnaire on "Markets" and "Produce."
(2.) Reports on Coffee Experiments.
(3.) Fortnightly Crop Reports.
(4.) Results of Agricultural Competition.
(5.) Fortnightly reports on work done at Hosororo Station.
(6.) Monthly reports on work done at Hosororo Station.

EDGAR BECKETT,
Agricultural Superintendent.

DEPARTMENT OF AGRICULTURE.

REPORT ON THE ESSEQUEBO DIVISION FOR THE YEAR 1930.

REPORT ON THE ESSEQUEBO DISTRICT FOR THE YEAR 1930.

Staff.

A. deK. Frampton, C.D.A.—Agricultural Superintendent.
A. A. Abraham —Assistant Agricultural Superintendent.
J. E. Wilson —Assistant Agricultural Instructor, Wakenaam.
H. C. Jaisingh —Field Overseer, Anna Regina Estates.
A. S. Khan —Bookkeeper, Anna Regina Estates.

General.

My chief work has been in connection with the Bush Lot Land Settlement but in addition to this extensive inspection tours have been undertaken throughout the district, including Wakenaam. Lectures have been given at various centres and the majority of the farmers of the district have been visited at one time or another. Special efforts have been made to introduce pure line varieties of paddy throughout the district and demonstration plots were arranged at various centres for cultivators to compare the yields with that of their own fields.

2. The autumn paddy crop was an excellent one throughout, and it was encouraging to note that all the pure seed distributed yielded well despite the poor weather conditions, *i.e.*, lack of rain after the completion of planting. The only exception to this was at Wakenaam, where the lack of rain had an adverse effect on the crop, resulting in reduced yields from both pure and local seed.

3. A trial shipment of 400 bags of Blue Stick paddy from the Anna Regina estates was made to Canada in July and it is hoped that this will be another outlet for paddy.

4. During the year, the Henrietta seed station was started for the testing of various varieties of selected paddies and for the multiplication of Demerara Creole and Blue Stick paddies.

5. I was also gazetted Chairman of all local Credit Banks on the Essequebo Coast from November 1, and regular monthly meetings have been held since that date.

Agricultural Experiments—Henrietta Experimental Station.

6. *Rice.*—The Henrietta Paddy Seed Station of 10 acres was started in June, 1930. The object of the station is to carry out varietal tests and the multiplication of those varieties giving the best results.

7. The first crop in 1930 was planted somewhat late with pure seed supplied from the Experiment Station, Georgetown. In all, 10 acres were sown. Harvesting commenced during the last week in May and a total of 259 bags was obtained. The harvest was too late for seed distribution, unfortunately, and it was only possible to distribute 72½ bags. The balance was sold to a Canadian Rice Mill as a trial shipment. The variety was Blue Stick. The farmers, who were supplied with seed, obtained excellent results; the sample of paddy reaped being well above the average. The yields obtained from the improved seed were in some cases as high as 7 bags per acre in excess of yields obtained from the local seed.

8. The areas planted with pure seed and the increased yields obtained had a great influence on the applications for pure seed from the paddy station's Autumn Crop 1930. Unfortunately, the weather was so dry during the early planting season that many farmers did not attempt to plant the Spring Crop (December, 1930 sowing) and the total acreage will be less than last year. The pure seed has, however, been kept for the May-June sowing. The sample of paddy reaped from

the pure seed makes a far better sample of rice and some estates have now started buying on quality. This will be a further encouragement for the farmers to sow pure line seed.

9. The Autumn crop from the seed station was harvested during the second week of November, 236 bags of 143 lbs. (gross) being obtained. This yield was obtained from 9 acres ; (1 acre being reserved for experimental purposes) and considering the season was very good. Practically no rain fell after the crop was planted out. Owing to lack of irrigation water in early December, no Spring Crop has been planted on the station. All seed for sowing on the Henrietta station is selected from single heads, during the harvest of the previous crop.

10. *Varietal Tests.*—A varietal trial was carried out on the Experimental Station with 12 varieties of paddy, as follows :—

VARIETY.	ORIGIN.
Demerara Creole.	British Guiana.
Blue Stick.	,, ,,
No. 76.	,, ,,
No. 79.	,, ,,
Carolina.	United States.
Lady Wright.	,, ,,
Mexican Edith.	Central America.
C. 14-31.	Burma.
A. 16-34.	,,
Blue Rose.	Canada.
H. 7.	British Guiana.
No. 75.	,, ,,

This experiment was laid out on the Latin Square method of plot replication. The results of this experiment in order of merit are as follows :—

Variety.	Yield per plot lbs.	Per cent.	Bags paddy per acre—140 lbs.
79	20.34	130.00	29.1
75	19.23	130.00	27.5
Demerara Creole	19.03	128.00	27.2
76	18.18	123.00	26.0
Blue Stick	18.11	122.00	25.9
H. 7	17.91	121.00	25.6
A. 16-34	15.69	106.00	22.4
C. 14-31	15.54	105.00	22.2
Lady Wright...	10.08	68.00	14.4
Carolina	9.60	65.00	13.7
Mexican Edith	9.45	64.00	13.5
Blue Rose	5.80	39.00	8.3
Standard Error of Difference	0.64	4.34	0.9
Mean of all plots	14.84	100.00	21.2

Sand Reef.

11. Approximately two acres were cleared on the sand reef at Henrietta for carrying out observations on various crops and also for the propagation of selected varieties of groundnuts, pineapples, sweet potatoes, guinea corn, etc.

12. *Groundnuts.*—A quarter acre plot was cleared for this crop and the following varieties were tried :—

(*a.*) Spanish.
(*b.*) Exotic.
(*c.*) Basse.
(*d.*) Virginia Bunch.
(*e.*) Special Virginia.

Both shelled and unshelled nuts were sown. Shelled or unshelled did not have any effect on the yield, but where ants were prevalent less losses were observed with the unshelled material.

13. The heaviest yields were obtained from the Basse and Exotic varieties, the latter yielding the highest percentage of full shells. Virginia Bunch was very poor, having nearly 70 per cent. of empty shells. Basse Exotic and Spanish varieties are being distributed for planting. The percentage yield of full shells obtained is given below :—

	Percentage full nuts of total yield.
Spanish	71
Exotic	78
Basse	57
Virginia Bunch	7
Special Virginia	22

14. *Pineapples.*—A collection of as many varieties of pineapples as possible has been made for the purpose of observation and eventual experimentation with the best types. These suckers were planted during June and July. The list of varieties planted with their origin is as follows :—

VARIETY.	ORIGIN.
English Sweet.	Essequebo Coast.
Sugar Loaf.	,, ,,
White Pine.	,, ,,
Red Spanish.	Montserrat, B.W.I.
Red Spanish.	Trinidad, B.W.I.
Black Antigua No. 1.	,, ,,
Black Antigua No. 2.	,, ,,
Chocoma.	,, ,,
Sugar Loaf.	,, ,,
Red or Brown Montserrat.	Demerara.
Buck.	,,
White.	,,
Bush Pine.	,,
Spanish.	Canal No. 1, West Bank.
Montserrat.	,, 1, ,, ,,
Sugar Pine.	West Coast, Demerara.
Buck Pine.	,, ,,
White Pine.	,, ,,
Water Pine.	,, ,,
Maipourie.	,, ,,
Die Montserrat.	,, ,,
Comma.	Berbice.
Montserrat.	,,
Red Spanish.	North West District.
Tiger Head.	,, ,,
Maipourie (selected).	,, ,,
Water Pine.	,, ,,
Montserrat.	,, ,,
Bulls Head 1.	,, ,,
Sugar Loaf 1.	,, ,,

15. *Sweet Potatoes.*—A collection of different varieties of sweet potatoes has also been made for experimentation and propagation of planting material as it becomes available. At present the vines are being multiplied prior to laying out an experiment. The following is the list of the varieties :—

NAMES.	ORIGIN.
Pink Stem.	West Coast, Demerara.
White Stem.	" " "
Strongman.	Berbice.
Choke Throat.	"
Turkey Claw.	"
Euclip.	"
Four varieties unnamed.	North West District.
Garden cuttings.	Botanic Gardens.
Milton.	" "
Strongman.	" "

It is hoped to add some varieties from Barbados to this collection.

16. *Sorghum.*—Twenty-six varieties are being grown to build up a seed supply for distribution. The best varieties are being harvested and distributed to the settlers at Bush Lot for planting on the provision farms. Guinea corn makes a very good flour, porridge, and also a stock feed. Farmers in the district are also keen on obtaining some of this seed.

17. *Yams, etc.*—A small area has been planted with Barbados and purple yams to build up a supply for planting material. With the cultivation of the sand reef areas increasing, local farmers are desirous of acquiring yams, which are an excellent food and also which have a good market value locally. A small area has been planted with white eddoes for trial.

18. *Edible Beans.*—A collection of these is being made for obtaining a seed supply for distribution. The following have been collected and sown:—

Local Pigeon Peas.
Barbados Peas.
Trinidad Peas.
Mearns Cow Peas.
Mung.
Dwarf Bonavist.
Waby.

The results, however, were disappointing, due to the dry weather, but it is proposed to make further trials next season.

19. *Green Manures.*—The following green manures have been established for future seed supplies. It is hoped to introduce these green manures as "covers" in coconut cultivation:—

(1.) Bengal Bean.
(2.) Canavalia Gladiator.
(3.) Canavalia Ensiformis.
(4.) Stizolobium Niveum.
(5.) Stizolobium deeringianum.

20. *Black Eye Peas.*—All the pineapples and crowa suckers were interplanted with black eye peas, to act as a weed smother and to obtain a seed supply for distribution. As a weed smother for interplanting, either between pineapples, crowa-plants or guinea corn, the black eye pea is excellent, at the same time yielding well. Local farmers are anxious to obtain seed for covering down their provision farms. Black eye peas are also a favourite vegetable when cooked, either as green pods or dry peas and have the advantage of being a quick bearing crop, producing pods for harvest in from 65–75 days. 150 lbs. have been distributed to the settlers at Bush Lot and local farmers, from seed grown on the sand reef.

21. *Other Legumes.*—The following legumes are also being tried :—

Early Buff.	Cow Peas.
Early Red.	" "
Grout.	" "
Brabham.	

A small amount of seed of the above has been received from the United States and sown for observation and multiplication purposes. Cow peas make an excellent cover crop or green manure and can also be fed to stock either as green leaf or a meal made from the dry peas.

22. *Observation and demonstration Plots.*—Some observation plots were laid out with special seed selections, with a view of obtaining a shorter age paddy. An early ripening selection of Blue Stick was tried and gave some indication of earlier maturity than the bulk of the crop. It needs further observation before any definite result can be obtained. Other observation plots laid down were :—

(*a.*) Number of seedlings planted per hole.
(*b.*) Spacing between holes.

The ordinary Blue Stick selection was given the usual spacing—one foot—whilst the plants in the other observation plots were given one half of this distance. These observation and spacing plots were not laid out with a view of obtaining a higher yield, but with the object of harvesting a more evenly matured sample.

23. Spacing observation plots will be tried again with the next crop, as it was found that with closer spacing, and planting more seedlings per hole, the ears ripened more evenly than is usually the case with the Blue Stick variety. Unevenness of ripening is a bad feature in the Blue Stick variety and is responsible at times for a poor sample being harvested, *i.e.*, a sample containing green and immature grains. This gives rise to a milled sample containing discoloured grains and is inclined sometimes to give the paddy a musty odour.

Agricultural Competitions.

24. Two competitions were held in the district during 1930 ; one a paddy competition for the best block of pure line paddy of not less than one acre in extent, grown from the Department's seed and the other a provision farm competition for the best provision farm of not less than a quarter acre, in the district between Affiance and Richmond.

25. The entries for the paddy competition were very poor indeed, only 17 entries were received, despite the fact that wide publicity was given throughout the district. The East Indian driver from the station who is an expert at " rogueing " and differentiating between " red rice " and the pure type when the paddy is in the ear, was sent round to many of the plots when the paddy was coming into ear, to give detailed instructions on these two points This proved very successful and the cultivators were keen to take his advice. Instructions were also given on the question of single head selections for seed purposes. Many of the samples reaped were of excellent quality and careful attention has been paid to the elimination of all volunteer plants. In accordance with the conditions of the competition the best samples are being reserved for seed purposes on the estates concerned. The benefits of the increased yields obtained from pure seed did not require any further emphasising, as this was sufficiently obvious when comparison was made between plots sown with pure seed and adjacent areas sown with the old mixed seed. It is hoped to get tenants to select their own seed during next harvest, *i.e.*, to set aside one-fourth or one-eighth of an acre and pay special attention to rogueing and elimination of all volunteer plants. Thus, if sufficient

cultivators carried this out on an estate the proprietor could be assured of a pure seed supply for all his paddy land. The prize-winners were as follows:—

Raghoobeer, Pln. Affiance—1st prize	...	$ 25 00
Pryag, Pln. Spring Garden—2nd „	...	15 00
Budhoo, Pln. Affiance —3rd „	...	10 00

The provision farm competition had to be abandoned through lack of entries and interest generally.

26. *Bush Lot Settlement Competitions.*—During the year two competitions were held in connection with the Bush Lot Settlement—a paddy competition in which all the settlers participated and a garden competition.

27. In connection with the first-named competition, nurseries were all made according to the instructions given, and not more than 7 lbs. of seed were allowed per square rod. This produced much stronger seedlings than is usually the case. Instruction was also given in "rogueing" and single head selection for seed purposes. The former was carried out fairly well, particularly by some persons cultivating the old land where a different variety had been cultivated the previous crop, but the latter did not obtain the support it deserves. Demerara Creole was planted throughout and considering the inadequate rainfall and water supply, the yields were good. The prize-winners were:—

Ali Husen—1st prize	...	...	$ 10 00
Manikran —2nd „	...	...	7 00
Dasayi —3rd „	...	...	5 00
Somwaru —4th „	...	...	2 00

28. The Garden Competition proved to be a great incentive in getting the gardens started, more especially as many of the settlers lacked previous experience of gardening. The general standard improved as time went on, but the dry weather was unfavourable throughout. The prize-winners were:—

Budhoo —1st prize	...	...	$ 10 00
Sunderlall—2nd „	...	...	7 50
Sukhraj —3rd „	...	...	5 00
Bandha —4th „	...	...	2 50

MISCELLANEOUS.

29. The following reports were submitted to the Director during the year:—

(1.) Survey of Rice Mills in Essequebo.
(2.) Survey of Markets in Essequebo.
(3.) Varietal Trials in Field Test Plots.
(4.) Reports on Agricultural Competitions.
(5.) Crop Reports.
(6.) Monthly Progress Reports.
(7.) Answers to Rice Questionnaire.

30. In conclusion, I wish to add that it would have been impossible to have carried out all these multifarious duties without the support and loyalty of the staff who have worked overtime on many occasions without hesitation or demur.

A. DEK. FRAMPTON,
Agricultural Superintendent.

DEPARTMENT OF AGRICULTURE.

REPORT OF THE WEST DEMERARA DIVISION FOR THE YEAR 1930.

REPORT OF THE WEST DEMERARA DIVISION FOR THE YEAR 1930.

Staff.

J. D. Gillespie, B.Sc., (Edin.)—Agricultural Superintendent.

General.

I assumed the duties of Agricultural Superintendent of this District on my arrival in the Colony on January 27, 1930. During the year extensive inspection tours have been carried out throughout my area including the Island of Leguan. The number of visits to farms has greatly increased for advice in connexion with the cultivation of agricultural crops while supplies of various cuttings and seeds have been made from time to time. Special interest has been shown by the farmers in growing pure line seed paddies and it is hoped that a barn will be erected at an early date to enable supplies to be made during the April–May sowing period. The difficulty at the present moment is to persuade farmers to store their pure line paddy for the next sowing, due to financial requirements and storage accommodation. In consequence of this pure line seed has not been distributed between farmers to the same extent as is desired but has, of necessity, been sold as rice. I am hoping, however, to get a few enthusiastic farmers to cultivate a small area of their farms under pure line to meet their own seed requirements and arrangements have already been made to supply seed to those who may have promised to do so.

Sugar.

2. *Sugar Cane Experiments.*—There are five Sugar experiments in West Demerara (including East Bank). The experiments at Plantation Uitvlugt are being supervised in conjunction with the Cane Agronomist whilst those at Diamond are directly under the control of the Cane Agronomist. The experiments at Plantation Uitvlugt are progressing favourably although the young canes suffered during the dry spell.

Rice.

3. *Rice Mill Inspection.*—The importance of this survey was stressed at a Conference of officers held at the Head Office in April. There are approximately 40 rice mills exclusive of those on the East Bank, Demerara River. A report was forwarded in May giving full details about each mill.

4. *Rice Competitions.*—A competition, for the best block of transplanted paddy of not less than one acre in extent, was held in West Demerara during the year. Owing to the fact that this was the first competition of its kind held in the District it was not an unqualified success. The number of entries received was small and in consequence only one prize was awarded owing to unsatisfactory methods of cultivation and in-attention to weeding, etc.

5. *Rice Grading.*—Special meetings were held in connexion with the rice grading regulations throughout my district and the methods of grading explained. Guide samples and leaflets were widely distributed. In October and November all rice for export proceeding from West Demerara was sampled by me on the Vreeden-Hoop stelling and sent to the Rice Grading Office, Georgetown, for grading. In all 4,000 bags of rice were sampled in this way during the two months. In December due to illness this practice was temporarily discontinued; the samples being taken from Georgetown.

6. *Man Rice.*—Information was sought with regard to the prevalence of "man" rice in the District but this was found to be practically negligible. Many theories were advanced by cultivators as to its cause.

7. *Discoloration of Rice.*—The question of whether the discoloration of rice is the fault of the grower, the miller, or the weather was reported on, and necessitated a careful scrutiny of milling customs and methods. This question is still under investigation.

Fruit.

8. Arrangements have been made during the coming year to plant up ten acres of selected budded Marsh grapefruit plants at Uitvlugt. The land is now being prepared. The plants are being supplied from the Botanic Gardens at the request of the Director.

9. Experimental crates of pineapples were sent to Canada for canning and reports were furnished along with samples of the canned fruit.

10. Representations of Canadian canning companies when visiting the Colony were facilitated in their investigations and pineapples were supplied them for experimental canning purposes.

School Gardens.

11. A complete survey was made of the school gardens in the West Demerara and Leguan District. A scheme is now under preparation for the opening up of School Gardens in my area during the coming year. The difficulty is the procuring of suitable land adjacent to the schools and the supply of implements.

Co-Operative Credit Banks.

12. The Agricultural Superintendent has been appointed Chairman of six banks and regular monthly meetings have been held. Committee attendances have been good, but without exception, there are a large number of overdue loans in each bank. Careful scrutiny is now being made before any loans are given out and defaulters have been warned that unless their overdue loans are paid up without further delay, writs will be filed against them.

Insect Pests and Fungoid Diseases.

13. In co-operation with the Entomological and Mycological Divisions, experiments on attacked and diseased plants have been started at Pouderoyen, No. 1 Canal, Good Intent and Sisters, Vreed-en-Hoop and Leguan.

Miscellaneous.

14. *Marketing.*—Considerable time has been spent in acquiring and tabulating statistics of the various local products of the Colony with a view of examining marketing conditions generally and the possibility of opening up new markets, obtaining better prices, etc.

15. *Canals Polder Area.*—A very thorough investigation of the Canals Polder area lasting between two and three months in connexion with the proposed Drainage Scheme was carried out during the year. It further included a detailed survey of each farm in the area and an investigation of soil types and their classification.

16. *Exhibition.*—In September the Department organised a display at the British Guiana Workers' League Exhibition in the Promenade Gardens, Georgetown. The Agricultural Superintendent was appointed to the Committee in charge of the display.

17 *Gardens.*—A provision garden has been started at Best Hospital and good results obtained. It was primarily intended that this garden should act as a demonstration plot, but due to the lack of irrigation facilities, fencing, and the long dry period experienced from June to December, the plot had to be eventually abandoned until the May-June rains.

18. *Reports.*—The following reports were submitted to the Director during the year :—

1. Survey of Rice Mills in West Demerara.
2. Survey of Markets in West Demerara.
3. Varietal Trials in Field Test Plots.
4. Preliminary Report of Survey of Canals Polder.
5. Final Report on Canals Polder Survey.
6. Rice Conditions in the Island of Leguan.
7. Reports on Agricultural Competitions.
8. Crop Reports.
9. Monthly Progress Reports.
10. Answers to Rice Questionnaire.

JAMES D. GILLESPIE,
Agricultural Superintendent.

DEPARTMENT OF AGRICULTURE.

REPORT OF THE BERBICE DIVISION FOR THE YEAR 1930.

REPORT OF THE BERBICE DIVISION FOR THE YEAR 1930.

Staff.

H. Macluskie, U.D.A. (Aberdeen)—Agricultural Superintendent.
E. M. Morgan —Agricultural Instructor.

General.

1 arrived in the Colony on February 3 and assumed duties as Agricultural Superintendent, Berbice, (by taking over from Mr. H. D. Huggins) on February 29.

2. Mr. Morgan returned from leave and assumed duties as Resident Agricultural Instructor, Corentyne, on July 7, with Headquarters at Rosehall, Corentyne.

3. Work in this district has increased to such an extent that another Agricultural Instructor is needed. Rice Grading also calls for some assistance.

Sugar.

4. *Sugar Cane Experiments.*—Charge of the following sugar cane trials were assumed as from August 15 in collaboration with the Cane Agronomist.

Pln. Port Mourant.—Variety trial with the following varieties :—

D. 625 ; S. C. 12 (4) ; B.H. 10 (12) ; 666/18 ; 835/18 ; 73/20 ; 351/20 ; 118 ; 676/20.

This trial is laid out as a randomised block of four replications.

Pln. Port Mourant.—Manurial trial has been initiated with applications of Ground Limestone, Sulphate of Ammonia and Superphosphate of Lime which is designed to indicate :—

(*a.*) whether 1, 3 or 6 tons ground limestone per acre applied in the row gives the most paying results;

(*b.*) What is the optimum dose of Sulphate of Ammonia in the presence of Superphoshate of Lime alone and with 1, 3 or 6 tons of ground limestone per acre.

This trial has 16 treatments and 4 replications of each.

Pln. Blairmont.—Manurial trials are being conducted with Sulphate of Ammonia, Leathermeal and Kerazotine in varying applications with a uniform applications of 2 cwt. per acre of Superphosphate. This trial is laid out as a Latin Square of 7 treatments.

Pln. Blairmont.—A varietal trial with the following varieties :—

663 ; D. 10 ; D. 684 ; D. 625 ; S. C. 12 (4) ; 557 ; 666 ; B. H. 10 (12) ; 835 ; 814 and Bourbon.

This trial is laid out as a randomised block of 5 replications.

Rice.

Rice Experiments.—A variety trial was conducted at Pln. Port Mourant with the following 12 varieties of paddy :—

Demerara Creole ; Blue Stick ; No. 76 ; No. 79 ; Carolina ; Mexican Edith ; Lady Wright ; C. 14-31 ; A. 16-34 ; H. 7 and 75.

This trial was laid out as a Latin Square. After the crop had been reaped a milling test was carried out, the results are as follows :—

Carolina	—73	per cent.
Lady Wright	—72	,, ,,
C. 14-31	—72	,, ,,
Demerara Creole	—71	,, ,,
Blue Stick	—70	,, ,,
Mexican Edith	—70	,, ,,
75	—69	,, ,,
A. 16-34	—68	,, ,,
79	—67	,, ,,
Blue Rose	—67	,, ,,
H. 7	—67	,, ,,
76	—66	,, ,,

The results of the variety yield tests were as follows :—

Variety.	Yield per plot lbs.	Per cent.	Bags paddy per acre—140 lbs.
No. 79	26.03	170	37.2
Blue Stick	21.97	143	31.4
Demerara Creole	20.80	136	30.0
H. 7	19.76	129	28.2
No. 76	19.49	127	27.9
No. 75	18.50	121	26.4
A. 16-34	17.90	117	25.6
C. 14-31	16.94	111	24.3
Lady Wright	8.46	55	12.1
Mexican Edith	7.47	49	10.7
Carolina	4.70	31	6.7
Blue Rose	4.32	28	6.2
Standard Error of difference	0.95	6	1.4
Mean of all plots	15.33	100	21.9

A full report together with illustrations has been submitted.

6. *Rice Grading.*—Regulations came into force on October 1, at the end of the year the following quantities were graded at New Amsterdam :—

No. 2	...	4,204 bags.
Ungraded	...	4,806 ,,
Total...		9,010 bags.

7. The following table shows the destination of the total shipments :—

Destination.	No. 2.	Ungraded.	Total.
Trinidad	1,828	2,754	4,582
Barbados ...	*1,896	1,266	3,162
St. Kitts	360	120	480
Grenada	50	50	100
St. Lucia... ...	...	40	40
Antigua	70	575	646
	4,204	4,806	9,010

*25 bags regraded at Georgetown.

8. Two blocks of approximately 9 acres of Demerara Creole pure line paddy were grown, one at Pln. Port Mourant and the other at Pln. Rosehall. From these blocks 350 bags of paddy were obtained and arrangements made with the Estate Managers for distribution amongst their tenants.

9. *Rice Mill Inspection.*—A survey of the rice mills in the district—48 in number—was conducted and a full report submitted.

Other Crops.

10. Whilst no direct work of investigation on experiments have been carried out in other crops, advisory work has gone on and visits have been paid to cultivations throughout the district. Interest is arising for citrus fruits and demonstration plots would do much in this direction. It is hoped to establish a block of 10 acres at Blairmont next year.

Seed Distribution.

11. Imported onion seed and a quantity of beet seed have been distributed to farmers. Cabbage and tomato plants have been distributed to some farmers, allotment owners and gardeners. Sweet Potato cuttings and pine suckers were forwarded to other districts. Small quantities of Bengal Beans and Canavalia Beans have been given out to sugar estates for propagation purposes.

12. The demand for pure line paddy has been considerable but owing to the depression in the industry farmers are not willing to pay the price asked for. The establishment of seed farms will therefore do much in obtaining successful distribution of pure line seed.

Agricultural Competitions.

13. The following two competitions were held :—

(1.) For the best plot (not less than one acre) of transplanted paddy between Villages 55 and 60, Corentyne.

This competition attracted considerable attention and was keenly contested by 35 rice-growers. It served as a demonstration of cultural operations advocated and seed selection. The winning plot yielded 34 bags per acre and achieved full marks.

The winners were as follows:

1st Prize ($25) Kooblall, 57 Village.
2nd Prize ($15) Augard, 60 Village.
3rd Prize ($10) Jaimungal, 59 Village.

(2.) For the best miscellaneous farm between New Amsterdam and Mara.

This competition was keenly contested by a reduced number—only 9 being recorded. Again this competition served as demonstration of cultural operations.

The winners were as follows :—

1st Prize ($15) Charles Daniel, Sebastapool.
2nd Prize ($10) Daniel Chan, Phlegt Anker.
3rd Prize ($ 8) Charles Henry, Sebastapool.

Co-Operative Credit Banks.

14. There are eight banks in the district. Four on the West Coast under the Chairmanship of the Superintendent and four on the Corentyne under the Chairmanship of the Resident Agricultural Instructor. Chairmanship of these Banks was assumed in November and meetings have been held monthly.

School Gardens.

15. Investigations have been made on this subject with a view to starting work in the coming year.

Pests and Diseases.

16. No serious outbreaks have been recorded, but paddy nurseries suffered in varying degrees from caterpillars and ducks. Slight outbreaks of Brassolis in the coconut plantations were noted but nothing serious recorded. Demonstrations have been given in the extermination of coushi ants and other pests.

Miscellaneous.

17. *Visits.*—Throughout the period under review visits have been paid to sugar estates, cattle ranches, coconut and rice estates, and provision farms by the Superintendent and the Instructor. Items of interest have been freely discussed.

18. A demonstration of rice cutting and the use of threshing machinery was attended at Pln. Bath and a visit was made to the Abary Ranch where a herd of cross bred Herefords is kept.

19. *Specimens.*—22 plant specimens were forwarded to the Botanist for identification.

20. *Correspondence.*—282 items of correspondence were despatched as against 344 received. The following reports were submitted to the Director during the year :—

"Coastland cattle during the wet season" (with illustrations) (by the request of His Excellency the Governor).
Survey of Rice Mills in Berbice.
Survey of Markets and Produce in Markets.
Fortnightly Crop Reports.
Varietal trials with 12 varieties of paddy in field test plots at Pln. Port Mourant (illustrated).
Answers to Rice Questionnaire.
Reports on Agricultural Competitions.
Monthly Progress Reports.

21. *Weather.*—During the year 73.11 inches of rain have fallen in New Amsterdam Gardens. The heaviest rainfall occurred in June-July. The latter part of the year was very dry and a drought was feared. This was arrested, however, by rain in December. The rainfall per month is given below :—

Jan.	Feb.	Mar.	Apr.	May	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
8.32	0.92	2.62	9.56	10.43	13.41	19.46	2.44	0.81	.05	...	4.64

22. In conclusion, I wish to express my appreciation of the loyal assistance of the Agricultural Instructor. My sincere thanks are extended to Managers and staffs of sugar estates, cattle ranches, all agriculturists and others who on all occasions have been most willing to render many courtesies.

HECTOR MACLUSKIE,
Agricultural Superintendent.

DEPARTMENT OF AGRICULTURE.

REPORT OF THE ENTOMOLOGICAL DIVISION FOR THE YEAR 1930.

REPORT OF THE ENTOMOLOGICAL DIVISION FOR THE YEAR 1930.

Staff.

L. D. Cleare, Jnr., F.L.S., F.E.S.—Government Entomologist.
C. Williams —Laboratory Assistant.
M. V. Armoogan —Clerical Assistant.

General.

During the year I was absent from the Colony on leave from May 19 to December 13, and while on leave attended the Third Imperial Entomological Conference, held in London in June, as the official delegate of British Guiana. From October 18 to December 13 was spent at the Imperial College of Tropical Agriculture, Trinidad, on duty leave investigating certain parasites of the Small Moth Borers which occur in that island.

2. While in England, I took the opportunity of carrying out a certain amount of work at the Farnham House Laboratory of the Imperial Institute of Entomology under Dr. W. R. Thompson, and I would like to take this opportunity of expressing my thanks to Sir Guy Marshall, Director of the Imperial Institute of Entomology, and to Dr. Thompson of the Farnham House Laboratory, for the courtesies and assistance extended to me.

3. *Plant Protection Service Inspection and Fumigation.*—Many inspections of seeds and plants arriving in the Colony were made, and fumigations carried out where necessary.

4. *Collection and Library.*—The collection of insects in this Division continues to be added to as opportunity occurs. A considerable accumulation of work in connexion with the cataloguing and arranging of the collection occurred during my absence, and at the time of writing this has not been disposed of.

5. A new insect cabinet was acquired during the year which should go some way towards relieving the congestion in the collection as well as make for the better arrangement. The collection has now reached a size when it is necessary to undertake a complete re-arrangement. This work has been taken in hand and will be proceeded with as opportunity occurs during the coming year.

6. The collection of the Division was commenced by my predecessor Mr. G. E. Bodkin on the inception of the Division in 1911, and is the result of collections of insects made by Mr. Bodkin and myself since that time by contributions from other individuals, principally officers of this Department and other Government Officials. The collection may be considered as representative of the commoner insects of the Colony, and especially of the coastal area, together with the various insect pests of plants and animals.

7. The collection is greatly enhanced by the large number of determinations made by specialists, which it contains, and in this connection the services of the Imperial Institute of Entomology, through which institution most of these determinations have been secured, has been invaluable. Its value is further greatly increased by the careful and complete system of cataloguing which has been instituted recently. The collection is, therefore, of considerable value, not only economically, but also as representative of this section of the fauna of British Guiana.

8. During the year Professor J. G. Needham, Professor of Entomology, Cornell University, U.S.A., visited the Colony for the purpose of investigating the Odonota. Professor Needham while here very kindly examined the collection both of this Division and of the British Guiana Museum in this Order, and made determinations

of certain of the specimens. Since then further specimens have been forwarded to Professor Needham for his determination.

9. Mr. Arthur Hall also visited the Colony in the early part of the year, and made collections of Lepidoptera principally in the North Western District. Already as the result of his collection some new species have been described.

10. The Library of the Division has been maintained in good condition during the year.

Principal Crops.

SUGAR CANE.

11. No extensive outbreaks of insects occurred on this crop during the year, and the status of the insect pests remains substantially the same.

12. As the result of recommendations made by Dr. J. G. Myers of the Imperial Institute of Entomology while on his visit to the Colony during 1929, on a special investigation of the Small Moth Borers, His Majesty's Government, through the Colonial Development Fund, has been pleased to make a grant to the Colony for the purpose of carrying out special investigations on the biological control of Small Moth Borers. It is proposed to commence these investigations at an early date, and provision is being made under the grant for my secondment for this work, and the appointment of a Supernumerary Entomologist to take charge of the duties of the Division during the period of my secondment.

RICE.

13. With the enactment of an Ordinance (No. 18 of 1930) to provide for the grading of rice for export, and the passage of regulations prohibiting the export of rice infested by weevils, the importance of, and damage caused by, the rice weevil *Sitophilus oryzae* L., became a matter of inquiry. During my absence from the Colony, Mr. C. Williams, Laboratory Assistant, visited a number of mills and made observations on the conditions existing therein.

14. The status of the rice weevil, and the damage caused thereby, together with other insects infesting stored paddy and rice in the colony is now receiving my attention, and in the course of time a report on the investigation will be prepared. There can be little doubt, as pointed out some years ago, that the loss inflicted on the industry by the insects infesting this produce must be far in excess of anything at present realised.

COCONUTS.

15. In the early months of the year an outbreak of the Coconut Caterpillar, *Brassolis sophorae* L. occurred in the Mahaicony-Abary District and subsequently developed to considerable proportions in the eastern part of the area, inflicting extensive damage on one large coconut plantation.

16. During my absence from the Colony, Mr. C Williams, Laboratory Assistant, visited the District on several occasions and gave advice and assistance to the management of the property attacked, and to the farmers in the adjacent villages, on the control of the pest.

17. That the pest increased and the damage assumed the proportions it did was without doubt due almost entirely to the ineffectual manner in which the outbreak was dealt with in this particular area, for it was amply demonstrated in the other part of the district (namely, the Mahaicony or western part) that by the early institution and intelligent application of control measures the pest could be kept in subjection. In that portion of the district, although the pest made its appearance about the same time as in the other part, it never assumed proportions as to seriously affect the palms and this I attribute to the early and efficient carrying out of the necessary control measures.

18. Soon after the appearance of the pest, and prior to my departure on leave, I visited the district and made recommendations as to the control of the insect and the utilization of its parasites in this connection. Had these been carefully followed, and an ordinary amount of commonsense displayed in their adaptation to the conditions as they occurred, it is certain that the outbreak would have been brought under control quickly.

19. It cannot be too strongly emphasised that a general unkempt condition of a coconut cultivation greatly increases not only the liability to an attack of this pest, but also the factors which brings about an outbreak, and such conditions were certainly in great evidence on the estate which suffered most.

20. The outbreak, while unfortunate in itself, served the very useful purpose of amply demonstrating the fact that the control measures which have been recommended for this pest by me for a number of years past can with ordinary care and intelligent application keep the pest in subjection. In this connection I particularly refer to the conservation of the parasites as a regular routine duty, to be carried out in conjunction with the hand-collection of the insects by a gang of labourers. To successfully combat the insect, however, the early institution of control work is essential, delay in this direction may give the pest an advantage which can only be overcome after several weeks of work, the expenditure of a considerable amount of money, and the loss of a large proportion of the crop. With this knowledge, it is difficult to conceive how the pest can get out of hand sufficiently to cause the extensive damage that occurred on this occasion except through lack of interest and neglect on the part of those concerned.

There were outbreaks also of a lesser extent in the Mahaica District (Springhall) and in Georgetown.

21. During August a small outbreak of the locust *Tropidacris latreillei* Perty. occurred at Plu. Hope on the East Coast, Demerara. In all, some ten acres of coconut palms were attacked by nymphs of the insect, and while many palms were partly defoliated the damage could not be described as either extensive or severe. As is usual, the insect had previously been feeding on *Quassia* on the sand reef nearby and subsequently passed on to coconuts.

22. The Coconut Stem Borer, *Castnia Daedalus* Cram. continued to receive attention as opportunity occurred.

At the request of the Sexton of the La Repentir Cemetery a demonstration of the method of cleaning up trees affected by this insect was given during the month of November. Mr. C. Williams supervised this work, and some two hundred trees were treated.

During the year a report of this insect was received from Leguan Island, Essequebo River. This is the first occasion that the insect has been recorded from that island.

Other Crops.

23. *Ground Provisions, Vegetable and Garden Crops.*—A number of inquiries with regard to pests attacking these crops were received during the year and were dealt with; recommendations made, and control measures advised.

Third Imperial Entomological Conference.

24. In June the Third Imperial Entomological Conference was held in London, and, as previously mentioned, I attended as official delegate of this Colony. Some twenty-three representatives from the Dominions and Colonies in addition to representatives of Departments of the Governments, Stations and Institutions of the United Kingdom, were present.

25. In the absence of Earl Buxton, the Chairman of the Honorary Managing Committee of the Imperial Institute of Entomology, the proceedings were formally opened by Sir Sydney Harmer on the 17th of June.

26. Many subjects of scientific interests were discussed at the Conference, and visits were made by the delegates to Farnham House Laboratory, Cambridge University and Rothamsted Experiment Station and Pathological Laboratory of the Ministry of Agriculture at Harpenden, and a reception at the British Museum Natural History, and an exhibition of an entomological film at the Imperial Institute were attended. There was also an official dinner to the delegates given by His Majesty's Government at Lancaster House, St. James's, on 25th of June. The Conference terminated on the 27th of June.

27. A detailed report of the Conference has been published already by the Imperial Institute of Entomology, and it is unnecessary, therefore, to deal further with the subject here.

PUBLICATIONS.

28. During the year the following papers were published :—

"The Tannia Beetle, *Liggyrus ebenus* DeG."—In Agric. Jour. of B.G., Vol. III, No. 1, pp. 11-23, fig. 1, Pls. I-IV. March, 1930.

"The Destruction of Coushi Ants with Carbon Bisulphide."—In Agric. Jour. of B.G., Vol. III, No. 1, pp. 24-27, Pl. V, March, 1930.

Newspaper notices dealing with the Coconut Caterpillar, Locusts, and the Coconut Stem-Borer were published in the local press under the head of "Agricultural Notes" on July 8, August 17, September 2, and October 26.

L. D. CLEARE, JNR.,
Government Entomologist.

DEPARTMENT OF AGRICULTURE.

REPORT OF THE BOTANICAL AND MYCOLOGICAL DIVISION FOR THE YEAR 1930.

REPORT OF THE BOTANICAL AND MYCOLOGICAL DIVISION FOR THE YEAR 1930.

Staff.

E. B. Martyn, B.A. (Oxon.)—Botanist and Mycologist.
N. Persaud —Laboratory Assistant.

General.

A card index has been prepared of references to the diseases of crops grown in the Colony. This has been extended to include a quantity of relevant literature for some years back, and will cover current publications in future.

There was no serious outbreak of any disease during the year. The long wet season, however, was a somewhat heavy one, and several diseases of minor crops occurring in July were attributable to the very wet weather prevailing.

As noticed in previous Reports several diseases of the major crops of the Colony are related to environmental conditions rather than to the direct attack of organisms. Especially does this appear to be the case with Root Disease of Sugar Cane and Wilt of Coconuts. With a view to throwing further light on these two problems, soil analyses have been carried out in affected areas by the Chemist-Ecologist, and suggestions made as to possible methods of improving soil conditions. It is hoped that one or two planters will be able to carry out some experimental work on the lines indicated.

Sugar Cane.

Root Disease.—A bad outbreak of this disease occurred on one section of an estate on the West Coast of Berbice, in January. The weather has been extremely wet for some weeks previously, and the symptoms were reported as having developed during this rainy period. Nearly every stool in the effected area showed the typical withered appearance, and the diseased canes usually tended to form shoots from the lower nodes of the stem.

In the fields affected, the pegasse surface soil was underlaid by a yellow clay containing a large proportion of Magnesium. In addition, movement of subsoil water was very restricted. Remedial measures suggested, included betterment of the drainage, and liming.

Chlorosis.—A chlorotic appearance of cane in one corner of a field on the East Bank was attributable to the gases emanating from a "burnt-earth" heap immediately to windward of the area affected. The effect was very striking, stools over a distance of 50 yards from the heap showing total chlorosis of the distal end of many of the leaves; but this phenomenon is apparently of quite common occurrence under similar circumstances.

At the end of the year a chlorotic mottling was reported upon S.C. 12.4 cane at Sophia Experimental Station. The appearance was suggestive of Mosaic, and the fact that the younger leaves were mottled drew further attention to the outbreak.

On examination it was found that a number of stools in the field concerned were affected, but that usually the less vigorous stools were mottled. Although the mosaic-like appearance was to be seen on the younger leaves, the youngest leaves, not yet fully green, did not seem to be affected, and on those young leaves which were mottled, the chlorosis appeared rather unevenly distributed over the surface. Finally, in the outer leaves, where the chlorosis was very marked, rust coloured streaks appeared at intervals. These do not appear in Mosaic. The chlorosis appeared exactly similar to that observed upon Uba cane at Sophia at about the same period

a year ago (*i.e.*, at the beginning of the rains, after the dry season). In that case only the older leaves were affected and the mottling, which passed off in a few weeks, was clearly due to some physiological effect.

In the present instance also the appearance was considered as due to some soil factor. As a precaution, inoculations were made, by the pricking method advocated in *Porto Rico, with young mottled leaves of the S.C. 12.4 on to leaves of B.H. 10 (12) and D. 625. No transmission of symptoms was observable at the time of writing (3 weeks after inoculation) and it is to be expected that the chlorotic appearance on the S.C. 12.4 will pass away as new leaves develop.

Rice.

"*Man Rice.*"—Field observations on this disease have been carried out in the Department's Experimental Rice beds at Pln. Henrïetta, Essequebo, in conjunction with the Agricultural Superintendent. Varieties affected were Demerara Creole, Blue Stick, H. 7, 75, 76, 79, A. 16–34 and C. 14–31. The majority of the introduced varieties were quite free of it.

Though occasionally seen in the Nursery, the disease does not usually appear till soon after planting out. It is erratic in its occurrence, and only one block of rice at Pln. Henrietta was affected to any extent. Seldom more than one shoot of a plant is diseased, and on removal of this a number of healthy tillers usually form, which indicates a practical remedy. In the experimental plots, where the disease was worst, sometimes twenty to thirty per cent. of the plants had a diseased shoot.

Examination of a large number of young "Man Rice" plants showed the basal node of the diseased shoot to be discoloured, a feature not to be seen in healthy stems. From the discoloured area a fungus. *Fusarium* ? *moniliforme*, was usually obtained. Inoculation experiments with this fungus are in progress. It is to be noted that the disease, in several of its symptoms, especially the production of abnormally tall and somewhat chlorotic shoots) appears to be similar to the "Bakanae" disease of Rice. This occurs in Japan, and has been shown to be due to a species of *Fusarium*.

Coffee.

Sclerotium Disease.—The outbreak during the period under review has been slight. Partly owing to this fact, and also owing to the difficulty experienced in obtaining correct and comparable returns as to yields, the spraying experiments carried out at the end of the previous year yielded inconclusive results. In the event of a bad outbreak, it might be possible to obtain figures as to the value of spraying by somewhat rough and ready methods, but to obtain reliable data, it is hoped in time to lay out a plot trial on the Department's proposed experimental coffee area. In the meantime, with the prevailing low prices of Liberian coffee farmers could scarcely afford to spray, even if by so doing their yields could be increased.

Coconuts.

Wilt Disease.—This continues to be prevalent upon the heavy clays of the coastland, and in such areas as are badly drained or otherwise unsuited to coconut cultivation. Soils from affected areas have been examined by the Chemist-Ecologist, and methods of ameliorating soil conditions advised. Unfortunately it is seldom possible for owners of affected plantations to incur the additional expense involved if such treatments are to be carried out.

Plantains and Bananas.

Wilt Disease.—The wilting of Plantains and Bananas was prevalent as usual in most of the cultivated areas of the Colony. Plantains and the Cayenne variety of banana, apparently allied to the Gros Michel, are both affected, as well as one or two other varieties grown to a smaller extent.

* Journal of Department of Agriculture, Porto Rico, XIV., 2, p. 60, 1930.

It has been suggested that this "Plantain Disease," as it is called locally, is identical with the Moko disease of Bananas, occurring in Trinidad, and caused by *Bacterium Solanacearum*. This species of Bacterium has however not yet been definitely isolated from diseased material in this Colony. Two or three species of Bacterium are found associated with diseased suckers, and occasionally also *Fusarium cubense*, the casual organism of Panama Disease, has been isolated, both from Plantains and Bananas.

Inoculation experiments were carried out with bacteria isolated and with *F. cubense*, on Plantains, Dwarf Bananas and Gros Michel Bananas. In the first place the petioles of four plantains were inoculated with a bacterial suspension, by means of a hypodermic syringe. No results being obtained, fresh isolations were made from diseased tissue, and four more plantains similarly inoculated. In addition, five were wounded at the base of the sucker, just below soil level, and inoculated with the bacteria, and in three cases with *F. cubense* as well. In no case were any symptoms of wilt noticeable after seven months. Also, thirteen Plantain and Banana suckers were inoculated with *F. cubense* in the first instance by dipping the base of the sucker into a spore suspension before planting, this same suspension being afterwards poured over the soil, which was in tubs. As the results obtained were again negative, some four months later the suckers were further inoculated by wounding below soil level and introducing portions of mycelium. When nine months old all the plants, though stunted by reason of being confined to tubs, were still healthy in appearance. The inoculations with *F. cubense* were made both with cultures isolated locally, and with one sent from the Imperial College of Tropical Agriculture by Dr. Wardlaw.

Observations on the "Plantain" disease in the field show that it is to be found both on pegasse and clay soils, that it may be prevalent over quite large areas, but that the worst outbreaks are usually confined to small portions of land. It is often noticeable that the worst areas are poorly drained. Suckers too, dug up in bad areas, usually show a large number of dead roots, suggesting that they are living under inherently unfavourable conditions. In addition, diseased suckers are often found to be damaged by insects. Pruning of suckers is seldom practised by farmers, and as a result, large and over-crowded clumps are formed, which soon become affected throughout. A peculiar feature is sometimes to be noted though, in that the débris of a badly diseased clump may occasionally give rise later to one or two healthy suckers.

All observations made tend to support the hypothesis of Dr. Wardlaw, Banana Pathologist of the Imperial College of Tropical Agriculture, who in his investigations into Panama Disease has shown clearly the considerable part played by soil conditions on the incidence and intensity of the disease.

Farmers have been advised to plant other crops on the areas in which the disease is worst, and elsewhere to practise a careful cultivation, with especial attention to pruning, and the avoidance of already diseased material for planting.

Miscellaneous Crops.

citrus.

During the long wet season, there were a large number of citrus seedlings lost in the Gardens, both in the seed troughs, and later when planted out in the seed beds. The principal cause of the trouble may be ascribed in each case to insufficient drainage. The clay soil of the Gardens, even when well pounded previously, and mixed with sand, becomes, very sticky after much rain. To provide better drainage, the seed troughs should have a complete layer of rubble at the bottom, and it is suggested that the seed beds in future be further drained by the use of pieces of bamboo.

Early in the wet season, seedlings in the troughs "damped off," a discoloured area appearing at the "collar," with which a species of *Fusarium* was associated. On another occasion a whole trough of seedlings shrivelled up just after the first leaves had appeared above ground. Investigation showed that while the leaves had been exposed to the sun for a day or two and the top soil was dry, the tap roots at a depth of one or two inches were penetrating a still wet and sticky clay.

Similarly in the seed beds, towards the end of the abnormally wet season, seedlings planted out in the beds began to wilt. The top of the shoot withered, and the stem tissues for several inches above ground level appeared dried up and dead, a pycnidial fungus sometimes being associated. Investigation showed that the tap root had invariably gone down into the very poorly drained clay at the bottom of the raised beds, and all the plants in the sunny periods between rain tended to wilt. The rains stopped suddenly in August, after which no further trouble was experienced.

PINEAPPLES.

Pineapples at the Sub-station Cecilia were affected in February by a disease common to most places where this crop is cultivated, and is growing under adverse conditions. It is known usually as Wilt, Blight, or Root Disease. In this case, the tips of the leaves withered, in some plants the leaves rotted, and in others the roots simply appeared to dry up. Stems cut open showed a reddish discoloration of the vasculars, similar to that seen in Root Disease of Sugar-cane, a somewhat analogous complaint. The plants concerned were very crowded, suffered from lack of water and were in a rather exposed position. No pathogenic organism was isolated from the affected tissue.

The varieties Red and Brown Montserrat and Maypouri were most affected. Red Spanish (Trinidad,) Black Antigua, and Trinidad Sugar-loaf seemed hardier, and the local Sugar Loaf appeared quite healthy, and resistant to the adverse conditions pertaining.

"*Black Eye.*"—Pineapples were received from the North West District in July, affected by this disease, which is common throughout the West Indies. All varieties were reported as being attacked, but Tiger Head proved more resistant than most. Affected fruits appear normal externally, but on cutting open dark brown or blackish spots are found in the flesh, beneath a few or many of the eyes. A species of *Penecillium* is found associated with the spots, the entrance of which is probably aided by insect injuries. No remedial measures are at present known.

TOMATOES.

Wilt.—A wilt of tomatoes at the Experimental Station was shown by successful inoculations on the varieties Brimmer, Cooper Special, and June Pink to be due to a sp. of *Fusarium*, which was identified by the Imperial Bureau of Mycology as *F. lycopersici.* This fungus causes a similar disease in most parts of the world in which tomatoes are grown. Its control is a difficult matter, but successful results have been obtained in certain instances by the use of resistant varieties.

A bacterium isolated from wilted tomatoes gave negative results upon inoculation.

Blossom End Rot affected the Bonny Bess variety at Sub-station Cecilia.

Leaf Mould Disease.—A case of withering of tomato leaves was reported during July, and a species of *Cladosporium* was found associated. From the similarity of the symptoms it appeared to be identical with the disease caused by *C. fulvum* Cke., which is prevalent in the West Indies, but is only serious during wet weather. The affected plants were reported as growing under extremely moist conditions.

SOYA BEANS.

Pod Rot.—A rotting of ripening pods was observed at Sub-station Cecilia towards the end of July. The pods only were affected, and a species of *Phomopsis* was found associated. Minute black pycnidia covered the exterior of the pod, and the fungus also penetrated the interior and attacked the seed. A similar disease of this crop, ascribed to *P. Sojae*, is reported as occurring in North Carolina, especially during wet seasons. The present outbreak was probably due to the pods ripening during a period of abnormally wet weather.

ONIONS.

Downy Mildew.—Onions at the Experimental Station were found to be attacked in January by a species of *Phytophthora*. The leaves, after becoming covered by the fluffy white mycelium of the fungus, wilted, and finally rotted. The outbreak occurred during a wet spell, when there was little sunshine, and only lasted for a short period. Removal and destruction of as much of the affected leaves as possible was advocated, in order to lessen sources of new infection. The bulbs were not directly affected.

ROSES.

Black Spot.—This disease, due to *Diplocarpon Rosae*, was found upon Rose leaves in Georgetown during the wet weather at the end of July.

Botanical Investigations.

PLANTAIN CULTIVATION.

The cultivation of plantains at the Experiment Station, to discover whether a more regular production of fruit could be obtained throughout the year, has been continued. During the previous year a bed had been planted at the beginning of each month with approximately twenty bulb suckers and twenty sword suckers. The resulting stools were pruned, a fruiting plant, a "follower," and a small sucker being retained in each. Parent bulb suckers bear fruit a month or two before the corresponding sword suckers, but in subsequent generations the period required to produce fruit is less distinct. The time elapsing between planting and the production of fruit varies from 13-18 months. The length of time necessary depended upon the season of planting, suckers planted during the wet months receiving a check at the outset which delayed their development. The results obtained showed that fruit could be obtained throughout the year by this method of extended planting, though the supply was somewhat irregular. The time elapsing between the fruiting of the parent sucker and that of the first follower appears to be about 6 months on an average, but varies with the season of the year and the vigour of the plants.

Rice Grass.

Two dozen plants of *Spartina Townsendii*, the Rice Grass of Europe, were received from England in August. This species has proved a valuable colonizer of muddy foreshores in England and on the continent, and has also proved of value as a pasture grass. It was therefore decided to experiment with its cultivation, to see how it fared in comparison with the local species of *Spartina*, *S. brasiliense*. This is also known as Rice Grass, and has spread over a considerable area of the East Coast shore. (A note on Rice Grass was published in Vol. III., 3 of the Agri. Jrl.).

The plants of *S. Townsendii* were set out in three plots, 8 plants in each. The plots were fenced round with barbed wire. Plot A. was on a sandy area of shore, opposite Kitty, which was only covered by the higher tides. After 2 months the plants there had died out. Plot B. was on a bare patch of mud, near the sea wall at Liliendaal, and was only covered by Spring-tides. At present 4 plants have survived, but have shown little or no tendency to spread. Plot C. was on a bare patch

of mud, some 100 yards out from the seawall at Liliendaal, and covered by every tide. One plant died, but the remainder have established themselves, and begun to develop into clumps. This latter situation therefore appears to be the most favourable but it still remains to be seen how the new species will compete against the local Rice Grass.

FIBRES.

During the year, renewed interest was taken in local fibre plants by several persons concerned with the possibilities of their cultivation on a large scale.

Crowa.—Enquiries were made in particular about this plant, and as a result a preliminary visit was paid to Christianburg to investigate its exact identity, concerning which some confusion appeared to exist. Crowa has been also called "Wild Pineapple," and reports have been spread from time to time that it is to be found in certain areas in large quantities; investigation showed, however, that the true "Wild Pineapple," which is to be found growing widely on many areas of sandy soil, only yields a very poor fibre. Crowa on the other hand, which gives a fibre of the highest quality, is only to be found cultivated, or on the site of old cultivations, and is by no means common. Both plants are to be classified botanically as *Ananas sativus*, whence the confusion has probably arisen. The origin of the variety known as Crowa is a matter of some interest. A third variety of pineapple which must be distinguished, is the edible type, also to be found only on the sites of Indian villages or similar areas of cultivation.

Subsequent visits were paid to Christianburg in the company of those interested in Crowa cultivation. Information was also sought concerning Patwa (*Urena lobata*) and *Malachra capitata*, and samples of fibre from both plants were prepared.

FOREST ECOLOGY.

An opportunity was afforded during August to accompany the officers of the Forestry Department during part of their survey of the Bartica-Supenaam Forest Reserve area. In addition to collecting, the intention was to carry out some ecological work on the lines adopted last year by the Oxford University Expedition. On investigation, the areas of bush surveyed were not found to be sufficiently typical, or of sufficient value, for sample plots to yield useful information. On the other hand, a series of "belt" transects were run through different types of bush, and showed indications of forming a useful source of information. They were 500 ft. in length and included plants with stems $\frac{1}{4}$ in. or more in diameter, and coming within 1 ft. of the tape on one side of it. Diameters and distance were judged by eye, whereby results were obtained more quickly, and with a degree of accuracy which was considered sufficient for the purpose. It should be possible for the Forestry Officers to run a series of such transects through the different types of bush, in different areas, and interesting information should be afforded thereby as to the general consistency of the undergrowth, and the frequency with which seedlings and saplings of the larger trees occur. Such details have perforce to be overlooked in the ordinary "strip valuation" of timber as carried out by the Forestry Department.

JENMAN HERBARIUM.

The collection of plants in the Herbarium has been added to as opportunity permitted. When accompanying the officers of the Forestry Department in August, not many trees were in flower, but a number of fungi were collected. Sheets of specimens collected during the year have been sent to Kew for identification.

Determinations were received early in the year from Mr. N. Y. Sandwyth of the Royal Botanic Gardens, Kew, and from Dr. H. A. Gleason of the New York Botanical Garden, of plants collected in the previous year on the Wiruni-Ituni

Savannahs. The promptitude with which these determinations were received greatly facilitated the preparation of the report on the Waranama Ranch, which is to be published in Vol. IV., i, of the Agricultural Journal.

The remainder of the fungi sent to Kew for determination in April, 1928, and in July and December, 1929, have been named where possible, and the sheets returned. Amongst the latter was a specimen which on examination proved to represent a new genus of Bulgariaceae, and is to be described as *Polycoryne Martynii*.

The routine work of the Herbarium has been ably carried out by the Assistant, and a start has been made with the remounting of the older sheets in the collection, many of which are in a very dilapidated condition.

It is intended to work through the cabinets in rotation, as time allows, the renewal of inner and outer folders also being carried out, and attention paid, where necessary, to labelling.

E. B. MARTYN,
Botanist and Mycologist.

January 14, 1931.

DEPARTMENT OF AGRICULTURE.

REPORT OF THE CHEMISTRY DIVISION FOR THE YEAR 1930.

REPORT OF THE CHEMICAL DIVISION FOR THE YEAR 1930.

Staff.

R. R. Follett-Smith, B.Sc., A.R.C.S. (London)—Chemist-Ecologist.
C. L. C. Bourne —Assistant Chemist.
L. A. Robinson * —Laboratory Assistant.
H. Sharma * —Laboratory Boy.
S. Soobrian —Laboratory Boy.

General.

The Division has been engaged in soil survey work on the coastlands and in the interior. A number of advisory visits have been paid to the plantations of the Colony and numerous samples of pasture grasses, fertilizers and feeding stuffs, etc., have been examined. In addition, special investigations of the wilt disease of coconuts, cane leaf blight and forest soil types are being carried out.

2. The Laboratory Assistant (Mr. L. A. Robinson) has carried out a considerable amount of routine analytical work of the Department during the period.

3. Two Laboratory Attendants have been permanently employed and have been responsible for the preparation and preliminary examination of soil samples, occasionally assisted by a third boy.

Soil Surveys.

4. During the period under review, four major soil surveys have been carried out.

5. *Plns. Bush Lot, Anna Regina, Henrietta and Richmond.*—A soil survey of Plantation Bush Lot, Anna Regina, Henrietta and Richmond was undertaken in March. 107 equally spaced samples were collected in the first and second depths of the estates. The area inspected was some 2,500 acres in extent, 90 acres of which consisted of a *markedly acid sand*, deficient in organic matter, lime and phosphates. This soil type is scattered and limited in area and therefore does not appear suited to the establishment of permanent crops, with the possible exception of coconuts. Pineapples, black-eye peas, and pigeon peas promise well on the unmanured sand reef soil. It is probable that, with adequate manurial applications and mulching during periods of drought, a variety of garden crops could be grown in this area.

6. The remainder of the area, some 2,400 acres, consisted of a *markedly acid silt or clay* of inferior lime status. A considerable part of this soil type had previously been under cane cultivation. The expense of irrigation and drainage is incurred for the whole area but only a part is cultivated. The subsoil of the area is markedly saline and the defective drainage of recent years is reflected in the salinity of the topsoil. The soil is suited to the cultivation of rice and possibly coffee, but if deep-rooted permanent crops are to be planted, the present drainage system must be improved. Trials with subsoil bamboo drains should be initiated.

7. *Supenaam River.*—During the month of August a visit was paid to the Forestry Survey Camp situated at Weri-Werai-Kuru Creek on the left bank of the Essequebo River. The main objects of the visit were—

(*a.*) to systemise the collection of information of the soils encountered by the Forestry Officers in the course of their surveys;
(*b.*) to assess the agricultural possibilities of the area;
(*c.*) to attempt to correlate the distribution of soil types with the distribution of the various forest types.

* Seconded from the Sophia Experiment Station.

The Forestry Officers subsequently produced a soil map of the area. The total area surveyed, approximately 76 square miles, consisted of:—

Brown Sand, 41 square miles in area, which may possibly be suited to the cultivation of pine-apples, coconuts and citrus. The soil is typical of large areas of the interior and until it is demonstrated that fertility can be maintained under a permanent crop no organised settlement can proceed.

White quartz sand, 8 square miles in area, is covered by inferior Wallaba. This soil type is probably more suited to support forest trees than agricultural crops. Crowa might, however, be cultivated on this soil.

Lateritic loam, 7 square miles in area, is suited to the cultivation of citrus.

Alluvial clay, 15 square miles in area. The soil is a heavy impervious grey or yellow clay, containing little or no organic matter. It occurs on the flats and margins of streams. It is unsuitable for cultivation.

Pegasse, 4 square miles in area, occurs in the vicinity of the Essequebo River. Such an area, if empoldered and drained, would be capable of supporting Liberian coffee.

8. During the survey five profile pits, in various forest types, were sampled. The results of examination will be submitted at a later date.

9. *Bartica Road.*—A visit was paid in company with the acting Conservator of Forests to the Bartica Road during the month of November. The soils occurring along the first six miles of the road were inspected and traverses were made from the 7th mile post. Five profile pits, in various forest types, were sampled. The results will be subsequently described.

10. *Sophia Experiment Station.*—During the period under review, a soil survey of the Sugar Producers' Experiment Station, Sophia, was undertaken. The most widely distributed soil is a markedly acid heavy silt. The soil of the four southernmost fields is lighter in texture; a markedly acid fine silt. The subsoil is heavier in texture and less acid in reaction. It is markedly saline. The area is deficient in lime, organic matter and phosphate. Field experiments, designed to indicate the magnitude of the economic application of these constituents, have been laid down with the co-operation of the Agronomist. Attempts have been made to improve the subsoil drainage conditions.

Visit of Professor Hardy.

11. F. Hardy, Esq., Professor of Chemistry and Soil Science at the Imperial College of Tropical Agriculture, Trinidad, visited the colony during the month of April. The principal object of his visit was to examine some typical igneous-rock soil profiles previously described by the late Sir John Harrison. He had, too, the opportunity of inspecting a number of sugar estates of the colony. The profile samples of the soil types of the interior, collected in company with Professor Hardy, have been submitted to examination in this laboratory and the results obtained will be included in a joint paper.

Advisory Visits.

12. During the period under review twenty-seven advisory visits have been paid to the plantations of the colony.

Examination of Samples.

13. During the period under review, 649 soil samples were collected and examined. The re-organisation of Sophia Sugar Experiment Station, which followed the appointment of the Agronomist, resulted in a marked diminution of the number of cane-juice samples analysed. During the year, only 71 juice samples, as compared with 1,110 samples for the previous year, have been analysed. A marked increase in this work is to be expected in the coming year.

At present only juice samples are examined. It is realised that the corresponding bagasse samples should be analysed, especially in cane variety experiments. Until an efficient disintegrator, such as a Wiley mill, is installed it is impossible to take representative sub-samples of the bagasse.

14. During the year the following samples have been analysed :—

	Number of samples.
Cassava (prussic acid content) ...	2
Feeding stuffs ...	7
Pasture grasses (ash analysis) ...	10
Rice (moisture determinations)...	3
Well waters	1
Subsoil waters ...	11
Fertilisers	6
Ground limestone ...	12
Insecticides, etc. ...	2

15. *Cassava.*—The two samples of cassava yielded 0.023% and 0.016% hydrocyanic acid on the fresh weight basis. The samples submitted appear to be intermediate between the bitter and sweet cassavas.

16. *Pasture Grasses.*—Seven samples of coastland pasture grasses were analysed in the early part of the year. The results were published in the Journal of the Department (Vol. III., p. 39). The investigation revealed the suitability of Demerara Primrose (*Asystasia scandens*) as a fodder plant. Three further samples have since been examined :—

(*a.*) Guatemala Grass (*Tripsacum sp.*). Whole leaves collected at the Government Stock Farm ;

(*b.*) Guatemala Grass. Leaves from which the midrib had been removed. Sample comparable with (*a*);

(*c.*) Wynne Grass (*Melinis minutiflora*). A sample of an introduced grass growing on the sandy soils of the interior, collected at Wauna substation, North West District.

17. The results of analysis, stated as percentages on the oven dry basis, are :—

	Guatemala Grass.	
	Whole leaves.	Leaves without midrib.
Total ash	10.10	10.01
Silica	6.40	5.83
Silica free ash	3.70	4.20
Lime (CaO)	0.15	0.13
Phosphate (P_2O_5) ...	0.58	0.35
Nitrogen	1.03	1.01

18. The silica content of the ash of both samples is high, the silica-free ash content is low when compared with other grasses grown at the Stock Farm. The lime content of both samples is very low. The phosphate content of the whole leaves is higher than that of the majority of the other pasture grasses of the Stock Farm. It is apparent that whole leaves of Guatemala Grass should be fed to the animals.

	Wynne Grass.	Mean of five natural Savannah Grasses.
Total ash	5.44	7.42
Silica	1.57	5.81
Silica-free ash	3.87	1.61
Lime (CaO)	0.48	0.16
Phosphate (P_2O_5) ...	0.26	0.05
Nitrogen	1.38	0.55

19. The soil occurring at Wauna substation is identical with that found on the Berbice Savannahs in the vicinity of Waranama. The former has perhaps not been subjected to so much leaching and is probably in a slightly higher state of fertility than the latter. The sample of Wynne grass contains markedly more silica-free ash, lime and phosphate than do the grasses of the Berbice savannahs. It does not, however, compare in these respects with the natural pastures of Great Britain. Nevertheless, it would be of great interest to attempt to establish Wynne Grass on the ranching savannahs of Waranama and to examine such samples of the grass in regard to their mineral matter content.

20. *Examination of Subsoil Waters.*—During the latter part of the year, fortnightly samples of subsoil water have been obtained from two fields of the Sophia Experiment Station. The results of the investigation will be submitted at a later date.

21. *Ground Limestone.*—Twelve samples of ground limestone have been examined. There appears to be some difficulty in obtaining limestone of sufficient fineness. A trial shipment of Canadian ground limesone was well divided (60.6 per cent. through a 100 mesh sieve), subsequent shipments, however, were markedly coarser. While the Canadian limestone contains less magnesium (1.1 per cent. MgO) and more lime (50.4 per cent. CaO) than the Trinidad ground limestone (7.2 per cent. MgO and 47.2 per cent. CaO), yet it would seem that Trinidad is at present the more reliable source of pulverised limestone.

Special Investigations.

22. *Cane Leaf Blight.*—During the early part of the year a visit of inspection was paid to an estate on the West Coast of Berbice. The canes growing in the area are subject to a metabolic disturbance known as "root disease," which causes the leaves of the cane to wither. The phenomenon has been described by Bancroft, by Harrison and by Bird, who attribute the blight to the unfavourable ratio of magnesium to calcium in the soil.

23. The soil of the area inspected consists of a pegasse layer, varying from 3 to 12 inches in depth, overlying a yellow or orange mottled grey clay. This clay subsoil is less acid in reaction than the subsoils of the pegasse lands of the estates of the West Coast, Demerara. The soils of the affected area contain markedly more chlorine than do those of the estates of West Coast, Demerara, where no blight is noted.

24. The canes of the area were tested for nodal accumulations of iron. The accumulation of iron was very slight. It seems unlikely that the canes were suffering from aluminium or iron toxicity.

25. The subsoils collected were examined as to their content of exchangeable magnesium and calcium. The results are compared with those obtained from composite subsoil samples from Sophia Experiment Station and from the West Coast, Demerara, situations where blighting is not noted.

EXCHANGEABLE BASES MGM/EQ: PER 100 GMS. AIR DRY SOIL (INCLUDING WATER SOLUBLE BASES).

	CaO.	MgO.	MgO. Ratio CaO.	Readily soluble salts.*
West Coast, Berbice, subsoil (affected area ... I.	2.7	13.5	5.0	266
Do. do. II.	3.4	20.4	6.0	435
Do. do. III.	2.2	11.7	5.3	284
Sophia subsoil (unaffected area) ...	6.1	22.3	3.7	555
West Coast, Demerara, subsoil unaffected area) ...	2.3	1.9	0.8	92

* The figures in this column represent the specific conductivity (mhos x 10^6) of 1:5 soil-water mixtures after 15 hours extraction.

26. It will be noted that the ratio of magnesium oxide to calcium oxide in the Berbice subsoils is very high. Where blighting is not noted (Sophia and West Coast, Demerara) the ratio is lower.

27. It has been suggested that the wilting is caused by an accumulation of *any* soluble salts in the soil. The content of readily soluble salts in these soils was accordingly measured by electrical means. The results appear in the last column of the foregoing table. There is a fairly large amount of readily soluble salts in the Locarno subsoils. The salinity of the subsoil of Sophia Experiment Station, an unaffected area, is much higher. The West Coast, Demerara, subsoil, another unaffected area, has a low content of readily soluble salts.

28. The few analyses here reported favour definitely the suggestion that the incidence of this cane blight may be correlated with an unfavourable ratio of magnesium to calcium in the soil. They do not support the theory that soil salinity is the cause of this disturbance. In either case the ameliorative measures to be adopted are identical. The movement of subsoil water should be facilitated, not only by deepening the existing drains but by the introduction of closed bamboo drains, similar to those laid down at Sophia. A recent experiment by the Agronomist shows that the initial expense of constructing these drains is recovered in the plant cane crop, leaving any additional increase in the ratoons as clear profit. When drainage conditions have been improved, judicious irrigation and the application of ground limestone should prove beneficial.

29. *Wilt Disease of Coconuts.*—During the month of March a visit was paid to an estate on the Essequebo Coast, in order to inspect an area of coconuts affected by bronze wilt disease. The disease appears to be similar to that occurring in Trinidad. It was first noted at this estate some two years ago and appears to affect trees some three or four years after they come into full bearing (when they are 13-15 years old). The wilt first becomes apparent with the browning of the older leaves, which subsequently collapse and drape themselves about the trunk. Finally, the crown falls, leaving the bare trunk. The affected areas are confined neither to the clay soils nor to the sand reef of the estate.

30. Four profile pits were dug in—

(*a.*) an affected area of sandy soil ;
(*b.*) an unaffected area of sandy soil ;
(*c.*) an affected area of heavy clay ;
(*d.*) an uneffected area of heavy clay ;

It must be remembered that there is no evidence to show that unaffected areas are permanently free from disease. It is possible that trees, free from wilt at the time of inspection, will later become affected. Differences in the analytical data for "good" and "bad" soils may therefore be small.

31. The results of textural and reaction examinations are appended :—

SAND REEF.

Good Area.				Bad Area.			
Depth.	Normal pH.	KCl pH.	*Index of Texture.	Depth.	Normal pH.	KCl pH.	*Index of Texture.
0"—3"	5.8	5.1	0	0"—3"	5.8	5.1	0
3"—12"	5.6	4.7	0	3"—12"	5.1	4.1	0
12"—24"	5.4	4.5	0	12"—24"	5.0	4.1	0
24"—36"	5.3	4.7	0	24"—36"	5.0	4.2	0
36"—48"	5.0	4.3	0	36"—45"	4.6	3.7	40
48"—60"	4.6	3.7	32	....	...	....	...

*Hardy, F., Jr. Agri. Sci. (1928), XVIII., p. 252.

CLAY SOIL.

Good Area.				Bad Area.			
Depth.	Normal pH.	KC1 pH.	*Index of Texture.	Depth.	Normal pH.	KC1 pH.	*Index of Texture
0 — 3″	4.7	3.7	46	0 — 3″	4.8	3.8	43
3″—12″	4.6	3.6	45	3″—12′	4.8	3.6	40
12″—24″	4.5	3.6	51	12′—24″	4.7	3.7	46
24″—36″	4.3	3.7	41	24″—36″	4.7	3.8	39
36″—48″	4.6	4.0	41	36″—48″	4.8	4.0	44

* Hardy, F., Jr., Agri. Sci. (1928), XVIII, p. 252.

32. There appears to be little connection between the incidence of blight and soil reaction. Little difference is noted in the soil texture of the clay soil profiles. The "good" sand area has a greater depth of sand than the "bad" sand area. There appeared to be no correlation between the occurrence of wilt and the lime status of the soils.

33. It was noted, however, that the good area of heavy clay contained more available phosphate than did the bad area. The carbon-nitrogen ratios of the top three inches of the four profiles are set out below :—

CARBON—NITROGEN RATIOS.

Depth	Sand Reef.		Heavy Clay.	
	Good area,	Bad area.	Good area,	Bad area.
0–3″	8·4	9·4	6·7	9·3

34. The content of readily available salts of the soils of the profiles were measured by determining the specific conductivity of soil-water extracts (1:5) which had been cultured for 15 hours. The results are appended :—

SAND REEF.

Good area.		Bad area.	
Depth.	mhos * 10^6	Depth.	mhos * 10^6
0 – 3″	28	0 – 3″	134
3″–12″	7	3″–12″	85
″12–24″	7	12″–24″	14
24″–36″	4	24″–36″	9
36″–48″	6	36″–45″	40
48″–60″	45		

CLAY SOIL.

Good area.		Bad area.	
Depth.	mhos * 10^6	Depth.	mhos * 10^6
0 – 3″	54	0 – 3″	67
3″–12″	40	3″–12″	31
12″–24″	68	12″–24″	35
24″–36″	289	24″–36″	141
36″–48″	650	36″–48″	266

35. There appears to be little connection between the incidence of wilt and the distribution of readily available salts. It should be noted that a marked salinity is evident in the clay area at a depth of two feet.

* It is interesting to compare these results with those obtained by Professor Hardy of the Imperial College of Tropical Agriculture in a more detailed survey of cocoanut areas affected by Bronze Wilt Disease in Trinidad. He records that the carbon-nitrogen ratios of the bad soils are higher than those of the good soils, and he notes that the available plant nutrients and the potential supply of plant nutrients, as measured by conductivity methods are markedly higher in the good areas than in the bad areas. These results have led to the establishment of manurial experiments in the affected areas in Trinidad.

36. It seems desirable that manurial experiments should be laid down in the diseased coconut areas of the colony. The Department is greatly handicapped in that it possesses no experimental area of coconuts.

Forest Soil Types of the Interior.

37. Advantage has been taken of the opportunity afforded by visits to the camps of Forest Officers, to excavate and sample profile pits in the various forest soil types encountered. 18 profile pits have so far been sampled and inspected. Examination of the soils is proceeding.

38. The necessity for increased staff and accommodation, if the normal expansion of work is to be maintained is patent. During the coming year the Laboratory Assistant will be largely occupied with the analysis of a greatly increased number of cane samples.

39. I wish to add that the work of the Division has been greatly facilitated by the energetic co-operation of the Staff during the year.

R. R. FOLLET-SMITH,
Chemist-Ecologist.

DEPARTMENT OF AGRICULTURE.

REPORT OF THE VETERINARY DIVISION FOR THE YEAR 1930.

REPORT OF THE GOVERNMENT VETERINARY SURGEON FOR THE YEAR 1930.

Staff.

Major T. Bone, O.B.E., M.R.C.V.S.—Government Veterinary Surgeon.
W. Motayne —Poultry Attendant.
W. Khan ; B. Bhola and J. Charles—Stockminders.

General.

The various districts have been visited with the view of inspecting stock and pastures. Frequent journeys have been made to investigate suspected outbreaks of contagious and infectious disease. Attendance has been given to police horses and inspection at wharves.

2. In the Colony we have a privately owned up-to-date abattoir. We also have many useless animals, that is, from the point of view of fresh, frozen or chilled beef. These animals can be utilised for extract of beef and bone meal and other by-products. There would be a ready sale for sterilised bone meal and also for meat meal, provided that the prices were right. A true appreciation of the value of our cattle between the producer and the abattoir would lead to business which would be an asset to the Colony.

3. A Cattle Owners' Association was formed during the year, but this Association does not interest the small farmers who own most of the cattle.

4. *Poultry.*—The Poultry Association formed this year is making steady progress. The success of this Association depends on the enthusiasm of its members who unfortunately are few in number. The objects of the Association are not to benefit a few breeders, but to benefit the Colony. The greater the number of members the sooner a poultry industry worthy of the name will be established. It is not necessary to own a pen of imported birds to become a member ; all poultry-keepers are welcome and will be given all possible assistance.

Animal Husbandry.

5. *Cattle.*—General improvement in the methods of animal management is not noticeable. A livestock industry has yet to be organised. Co-operation of the farmers is handicapped by the few animals owned by each individual farmer, and the fact that they own no pasture land. The future of cattle in the coastal belt depends on more intensive methods of management in enclosed areas. Groups of farmers owning or leasing certain fenced pasture areas, divided into paddocks, would realise the value of co-operation. It may not be possible to provide these facilities. It then remains for the land-owners to come to the assistance of the farmers.

6. For the effective control of cattle, the protection of crops, and the conserving of pastures, all land-owners should enclose their holdings with fences. The management and improvement of pasture land on the coast requires the same care for drainage, irrigation and protection as that which is given to cultivated land. Improvement of pasture must precede improvement of breed, and in intensive farming, which is making rapid progress, only animals of improved type will be profitable.

7. All the expense of fencing need not be borne by the land-owners ; the cattle-owners can pay their share in the form of agistment fees. Throughout the Colony there are healthy cattle, pigs and poultry ; each kind a nucleus of a possible profitable industry. Export markets exist, provided that the price be right, for livestock products in one form or another, *i.e.*, fresh, frozen, canned and extract.

8. *Pigs.*—The Pig industry is making no progress. This is partly due to the poor local market, and partly to lack of facilities for breeding and rearing a good type of pig on economical lines. Co-operation is required ; the formation of a Pig-Breeders' Association is indicated.

9. *Poultry.*—Several pens of standard bred birds have been imported and the results will be apparent next year. There can be few colonies where so many varieties of poultry can be seen, but in most cases the breeds have been allowed to deteriorate. The Poultry Association is attempting to stop this deterioration and to improve all breeds.

10. *Animal Health.*—Two outbreaks of Anthrax were reported, each involving the death of one animal. The in-contacts were inoculated. The heifers imported by the Government contracted Anaplasmosis, but recovered with treatment. A number of deaths amongst sheep due to wire-worm occurred.

11. Roup, diphtheria, and respiratory diseases have taken their toll of poultry, and a few cases of coccidiosis have been noted. Worms in poultry are very common. Two deaths of cattle due to careless handling of dipping fluid occurred. Attendance has been given to many cases of minor complaints and injuries.

12. A case of Tuberculosis has been rep orted by a veterinary surgeon, and in-contacts are now being tested with Tuberculin. Other diseases which no doubt are the cause of emaciation of some of the cattle in the savannahs will be brought under control when the necessary authority to deal with them is granted.

Stock Farm.

13. Bull stables have been built, and the number of pig and poultry houses with runs increased. Necessary store-houses have been erected. More building accommodation is required.

14. *Cattle.*—Two pure-bred Holstein-Fresian heifers were imported from Canada. Four bulls and two cows were sold at public auction. The bulls realised good prices. The cattle on the farm consist of two Holstein-Fresian bulls, four Holstein-Fresian cows, and two heifer calves. A third bull is at stud in Essequebo.

15. *Pigs.*—The two mature sows each farrowed two litters during the year ; young pigs were sold to farmers. There are three boars and six breeding sows now on the farm. Increase in the number of breeding animals has been governed by the funds available for building houses and runs.

16. *Donkey.*—One donkey stallion has visited various districts for stud work. The second donkey, which was useless for breeding with donkey mares, was sent into a district to be tried with horse mares. Unfortunately, this animal strayed on to the railway and was killed by a passing railway train.

17. *Sheep.*—The three sheep kept in Berbice proved useless for breeding purposes and were sold at public auction for butchery.

18. *Poultry.*—One pen of Rhode Island Reds, and one pen of White Leghorns were imported from England. The pullets have been trap-nested. Eleven pullets laid 741 eggs during October, November and December. Eggs for sitting will be for sale in the new year.

19. *Stud Animals.*—The services of the bulls stationed on the farm have been freely used. The farmers in the neighbourhood of Georgetown appreciate the value of pure-bred bulls. It is now necessary to keep two bulls on the farm. Bulls have been stationed in various districts during the year. Their services have not been used to any extent.

20. The general opinion of farmers in the districts is that the progeny of bulls of improved breed require too much care. They are not prepared to devote the

amount of time to their animals as is given by the more progressive stock-owners in the neighbourhood of Georgetown. The donkey stallion has visited several districts, but there is very little demand for its services.

21. *Working Oxen.*—The working oxen belonging to the Experiment Station are grazed on the farm, and keep good condition without supplementary rations.

Fodder Plants.

22. *Guatemala Grass.*—A small plot of this grass was grown by the Superintendent of the Experiment Station. It proved most palatable to stock, and an analysis made by the Chemist-Ecologist shows it to be a valuable fodder grass. The cultivation of this grass is being extended. It has been grown for some years by Mr. Sills on the Sandhills, Demerara River, as fodder for his stock with good results.

23. *Wynne Grass* grows luxuriously on the sandy soil of the sub-station Wauna in the North West District. A trial plot was grown by the Superintendent of the Experiment Station on heavy land. An analysis of this grass made by the Chemist-Ecologist compares favourably with those made of other grasses. This grass has a peculiar odour, and is said to be obnoxious to ticks.

24. The plot grown by the Superintendent of the Experiment Station grew as quickly and as luxuriantly as that grown on the sandy soil at Wauna. When fed to the stock on the farm, which are accustomed to Demerara Primrose and savannah grasses, it was eaten readily by some and after a little hesitation by all. An extended trial of this grass should be made on the intermediate savannahs. Even if it proves possible to grow improved grasses only in the neighbourhood of forest land and creeks on the intermediate savannahs the area available for cattle would be vast. It may be necessary to feed certain minerals on these savannahs, but over large areas in other countries, this is done and it can be done here.

Miscellaneous.

25. *Waste Products.*—On every farm there are what may for lack of a better term be called waste products. Co-operation between the Experiment Station and the Stock Farm prevents actual waste. The Superintendent of the Experiment Station has supplied the livestock with paddy, pigeon peas, bananas, plantains, sweet potatoes, guinea corn, beet, broom corn, soya beans and eddoes. None of these were good enough to be supplied to farmers, or had any market value. They have proved most valuable for livestock and without them the progress on the farm would have been curtailed.

26. *Revenue.*—Sale of stock and eggs, stud fees and inspection fees have yielded a revenue of $1,104.48.

27. *Importation of Breeding Stock.*—

Horse—1 Thoroughbred Stallion.
Cattle—2 Holstein-Fresian Heifers.
Sheep—3 Black-headed Persian.
Goats—5 Saanan goats.
Poultry—Rhode Island Red—4 pens.
Plymouth Rocks —3 „
Wyandottes —3 „
White Leghorns —1 pen.
Black Minorcas —1 „
Buff Minorcas —1 „

28. *Export*—

Cattle—1,076.
Hides—3,003.

T. BONE,
Government Veterinary Surgeon.

DEPARTMENT OF AGRICULTURE.

REPORT ON THE SUGAR EXPERIMENT STATIONS FOR THE YEAR 1930.

REPORT ON THE SUGAR EXPERIMENT STATIONS FOR THE YEAR 1930.

Staff.

C. H. B. Williams, D.I.C.T.A.	—Cane Agronomist.
C Cameron	—Field Manager.
L. A. Robinson	—Laboratory Assistant.
L. A. Forte	—Field Assistant.
J. B. Bourne	—Clerical Assistant.
J. F. Irving, M.C.	—Secretary to the Committee.

General.

Committee.—The Sugar Experiment Stations' Committee comprised in January, 1930 :—

The Director of Agriculture, Chairman.
Mr. G. E. Anderson, Pln. Diamond.
Mr. A. E. Craig, Pln. Ogle.
Mr. J. C. Gibson, Pln. Port Mourant.
Mr. C. Farrar, New Amsterdam.
Hon. R. E. Brassington, Georgetown.
Mr. A. Murison, Pln. Uitvlugt.

The same members with the addition of the Deputy Director of Agriculture were functioning at the end of the year. During the absence from the Colony of Messrs. Anderson, Gibson and Farrar, their places were taken by Messrs. R. P. Daggett, D. Clark and A. Waterfield respectively.

2. *Equipment.*—The bridge across the Lamaha Canal, mentioned in the last report, was erected in January.

The second plant shed has been rebuilt, glass being used for roofing.

Towards the end of the year the Committee purchased from Pln. Ogle a used punt, Tangye engine and pump for irrigation, flooding, etc. This equipment replaces a much smaller engine and pump which, together with the punt in which they were mounted, were considered beyond repair. Cordial thanks are extended to the Hon. F. J. Seaford for his help with regard to the engineering phases of the matter.

3. Buildings, bridges, boats, etc., have been kept in good repair throughout the year.

Cane Breeding and Introduction.

4. The varieties produced prior to 1928 which were selected last year and which it was decided to extend as rapidly as possible have made good progress in nurseries. It was possible in September to distribute planting material of ten of these canes to the sub-stations for the establishment of nurseries which will, in turn, provide experimental plots there. A still larger number, possibly fifty, will be available in sufficient quantities during 1931 to enable replicate tests to be started at Sophia and more nurseries to be established on the sub-stations.

5. The 1928 seedlings have been subjected to a further selection and 107 have been extended.

6. Of the 6,000 seedlings of the 1929 group, growing in field 10 West, 270 have been selected for further trial. Despite the fact that seedlings from some 20 different parents or crosses were present in the field, more than 67 per cent. of the stools selected were from the cross S.C. 12 (4) XD. 625 which appears to be very promising and which will be fully exploited in future.

7. The following is a list of the canes used as parents and of the number of boxes sown from each parent or cross this year. Where a cross is indicated it has been obtained by the "open crossing" method, and in all such cases the variety used as a female is named first :—

D. 835/18 ...	... 3 Boxes.
Diamond 10 ...	... 4 „
Diamond 10 X Ba. 6835	... 2 „
S.W. 3 ...	... 2 „
P.O.J. 213 ...	... 2 „
D. 238/17 X 145	... 2 „
P.O.J. 213 X S.C. 12 (4)	... 2 „
P.O.J. 1499 ...	... 2 „
Bourbon ...	... 2 „
Diamond 10 X S.C. 12 (4)	... 6 „
D. 53/27 ...	... 4 „
Badilla X D. 625	... 6 „
I.C.T. A. 36 X S.C. 12 (4)	...10 „
D. 625 ...	...12 „
D. 145 ...	... 8 „
D 145 X S.C. 12 (4)	... 2 „
S.C. 12 (4) ...	...12 „
P.O.J. 2725 X S.C. (4)	... 9 „
D. 666/18 ...	... 8 „
Caiara Roxa X S.C. 12 (4)	... 3 „
D. 1441/22 ...	... 3 „
B.H. 10 (12) X S.C. 12 (4)	... 3 „
S.C. 12 (4) X B.H. 10 (12)	... 3 „
B.H. 10 (12)	... 3 „
P.O.J. 213 ...	... 2 „
Ba. 6835 X S.C. 12 (4)	... 6 „
S.C. 12 (4) X D. 625	... 7 „
D. 625 X S.C. 12 (4)	...14 „
Ba. 6835 X D. 625	... 8 „
D. 238/17 X S.C. 12 (4)	...18 „
P.O.J. 2714 X S.C. 12 (4)	... 5 „
D. 571/20 ...	... 3 „

All of the recently introduced varieties mentioned in the last report are being multiplied except I.C.T.A. 222 which did not thrive and eventually died out. It should be possible to put P.O.J. 2878, G. 153 into a replicate test at Sophia next year.

8. The following varieties were introduced during the year and are now growing in quarantine :—

B. 726; B. 417 ; Co. 210 ; Co. 213 ; Co. 281 and Ba. 11569 from Trinidad, P.O.J. 253 ; M. and Co. ? from Martinique.

Experimentation.

9. The preliminary trial with Bamboo underdrainage, in Field 4 West, which was mentioned in the last report, has been reaped. The results obtained (*vide* The Agricultural Journal of British Guiana, IV.) were definitely in favour of the underdrainage.

10. Replicated variety tests, of the randomised block type, have been started at the places in collaboration with the respective Agricultural Superintendents and with the varieties indicated below :—

SOPHIA.

FIELD 13 EAST.	FIELD 17 WEST.
D. 625	D. 625
S.C. 12 (4)	S.C. 12 (4)
B.H. 10 (12)	B.H. 10 (12)
D. 689/13	D. 666/18
D. 695/13	D. 73/20
D. 835/18	
D. 351/20	
D. 557/20	
P.O.J. 2725	
P.O.J. 2727	

UITVLUGT.		DIAMOND.
FIELD 1 WEST.	FIELD 26 EAST.	FIELD G.D. 53.
D. 625	D. 625	D. 625
S.C. 12 (4)	S.C. 12 (4)	S.C. 12 (4)
B.H. 10 (12)	B.H. 10 (12)	D. 666/18
D. 666/18	D. 666/18	D. 835/18
D. 835/18	D. 835/18	D. 73/20
D. 203/20	D. 203/20	D. 351/20
Bourbon	Bourbon	D. 557/20
		D. 628/20
		Diamond 10
		Diamond 17

BLAIRMONT.	LUSIGNAN.	PORT MOURANT.
FIELD RIVERSIDE 11.	FIELD 19 EAST.	FIELD RESOURCE 6.
D. 625	D. 625	D. 625
S.C. 12 (4)	S.C. 12 (4)	S.C. 12 (4)
B.H. 10 (12)	B.H. 10 (12)	B.H. 10 (12)
D. 663/13	D. 31/17	D. 118
D. 814/13	D. 84/17	D. 666/18
D. 666/18	D. 447/17	D. 835/18
D. 835/18	D. 666/18	D. 73/20
D. 557/20	D. 351/20	D. 351/20
D. 684/21	D. 203/20	D. 679/20
Diamond 10		
Bourbon		

11. All these experiments will be reaped as plants during 1931.

12. The following manurial trials were started during the year in collaboration with the Chemist-Ecologist :—

(*a.*) Optimum limestone requirement (60 per cent. limestone passing a " 100 mesh " sieve) in Field 12 West, Sophia

Indicator : B.H. 10 (12)

Formulae : (1.) Control

(2.) 3 tons limestone
(3.) 6 tons limestone
(4.) 9 tons limestone
(5.) 12 tons limestone
(6.) 9 tons limestone

Plus 60 lb. Nitrogen as Sulphate of Ammonia per acre.

plus 0.5 ton Rock Phosphate.

Experiment continued.

Lime requirement : 6.1 tons $CaCO_3$ per acre.

Type : Latin Square. 36 plots of 0.05 acre each.

Lime broadcast February 11, 1930.

Planted : February 21, 1930, and will be reaped as plant canes April, 1931.

(*b.*) Manurial trial in Fields 5, 7 and 8 West, Sophia.

Indicator: D. 625

Formulae: (1.) Control
(2.) N_1
(3.) N_2
(4.) N_3
(5.) Ca
(6.) CaN_1
(7.) CaN_2
(8.) CaN_3
(9.) K
(10.) KN_1
(11.) KN_2
(12.) KN_3
(13.) P
(14.) PN_1
(15.) PN_2
(16.) PN_3
(17.) CaPK
(18.) $CaPKN_1$
(19.) $CaPKN_2$
(20.) $CaPKN_3$
(21.) KP
(22.) KPN_1
(23.) KPN_2
(24.) KPN_3
(25.) CaP
(26.) $CapN_1$
(27.) $CapN_2$
(28.) $CapN_3$
(29.) CaK
(30.) $CaKN_1$
(31.) $CaKN_2$
(32.) $CaKN_3$

Where N_1 =40 lb. Nitrogen per acre as Sulphate of Ammonia.
Where N_2 =80 lb. Nitrogen per acre as Sulphate of Ammonia
Where N_3 =120 lb. Nitrogen per acre as Sulphate of Ammonia.
Where Ca=Ground Limestone at 10 tons per acre (1.5 times the lime requirement), 60 per cent. of the limestone passing through a "100 mesh" sieve.
Where K=150 lb. Potash per acre as Sulphate of Ammonia.
Where P=150 lb. Phosphoric anhydride per acre, half plot as superphosphate and half as ground rock phosphate.
Type: Four Randomised blocks—Limestone and phosphate applied before formation of rows, other manures six weeks after planting. Plots 0.05 acre in area.
Planted: May, 1930, to be reaped as plants August, 1931.

(*c.*) Manurial experiment in Field Walton Hall 56, Hampton Court, Essequebo.

Indicator: D. 625.

Formulae: (1.) Control.
(2.) 40 lb. Nitrogen per acre as Sulphate of Ammonia in one early dose.
(3.) 80 lb. do. do.
(4.) 120 lb. do. do.
(5.) 120 lb. Nitrogen per acre as Sulphate of Ammonia in two doses.
(6.) 80 lb. Nitrogen per acre as Sulphate of Ammonia and 60 lb. phosphoric (anhydride) as superphosphate of lime in one early dose.
(7.) 80 lb. Nitrogen per acre as Sulphate of Ammonia, and 100 lb. Potash per acre as Sulphate of Potash in one early dose.

Type: Two Latin Squares of 49 plots each, plots being 0.029 acre in area.
Manures applied February 12, and May 21, 1930.
Canes will be reaped as plants in May, 1931.

(*d.*) Manurial trial on second ratoons in Field 14 East Uitvlugt, W.C., Demerara.

Indicator: D. 625.

Formulae: (1.) 40 lb. Nitrogen per acre as Sulphate of Ammonia.
(2.) 80 lb. do. do.
(3.) 120 lb. do. do.
(4.) 40 lb. do. do.
51 lb. phosphoric anhydride as Superphosphate.
(5.) 40 lb. Nitrogen —per acre as H.O.P.
and
70 lb. Phosphoric anhydride —No. 1 Compound Fish Manure.
(6.) 40 lb. Nitrogen —per acre as H.O.P.
51 lb. Phosphorican hydride —No. 2 Compound Fish
and Manure.
97 lb. Potash

Type: Seven randomised blocks, plots being 0.071 acre in area.
Manures applied May 29, 1930. Experiment to be reaped May, 1931.

(*e.*) Manurial trial in Field 47, Blairmont, Berbice.

Indicator: D. 625.
Formulae: (1.) Control.
(2.) 40 lb. Nitrogen as Sulphate of Ammonia in one early dose.
(3.) 80 lb. do. do.
(4.) 120 lb. do. do.
(5.) 40 lb. Nitrogen as Leathermeal in one early dose.
(6.) 40 lb. Nitrogen as Kerazotine in one early dose.
(7.) 120 lb. Nitrogen as Sulphate of Ammonia in two doses.
All the above in the presence of 2 cwt. superphosphate of lime per acre.

Type: Seven Randomised blocks, plots of 0.05 acre.
Planted: January 22, 1930, superphosphate applied February 10, 1930, and other manures on February 26 and May 6, 1930. Canes to be reaped as plants in April, 1931.

(*f.*) Manurial trial at Field Ankerville No. 6 Port Mourant, Courantyne.

Indicator: D. 625.
Formulae:
(1.) 4 plots as Controls.
(2.) 4 plots receiving 2 cwt. Sulp. of Amm. per acre.
(3.) 4 plots receiving 4 cwt. Sulp. of Amm. per acre.
(4.) 4 plots receiving 6 cwt. Sulp. of Amm. per acre.
(5.) 4 plots receiving 1 ton ground limestone per acre.
(6.) 4 plots receiving 1 ton ground limestone per acre and 2 cwt. S. of A. per acre.
(7.) 4 plots receiving 1 ton ground limestone per acre and 4 cwt. S. of A. per acre.
(8.) 4 plots receiving 1 ton ground limestone per acre and 6 cwt. S. of A. per acre.
(9.) 4 plots receiving 3 tons ground limestone per acre.
(10.) 4 plots receiving 3 tons ground limestone per acre and 2 cwt. S. of A. per acre.
(11.) 4 plots receiving 3 tons ground limestone per acre and 4 cwt. S. of A. per acre.
(12.) 4 plots receiving 3 tons ground limestone per acre and 6 cwt. S. of A. per acre.
(13.) 4 plots receiving 6 tons ground limestone per acre.
(14.) 4 plots receiving 6 tons ground limestone per acre and 2 cwt. S. of A. per acre.

(15.) 4 plots receiving 6 tons ground limestone per acre and 4 cwt. S. of A. per acre.
(16.) 4 plots receiving 6 tons ground limestone per acre and 6 cwt. S. of A. per acre.

All these formulae in the presence of 3 cwt. superphosphate of lime per acre. Limestone and phosphate applied in the row before planting. Other manures applied 6 weeks after.

Type : Four randomised blocks, plots of 0.05 per acre in area.
Planted : December 2, 1930, and to be reaped as plants in March, 1932.

The Agricultural Superintendent, Berbice, sampled the soil of this field and also co-operated in the laying down of this experiment.

13. All the aforementioned experiments, except the last, will be reaped during 1931. The trial in Ankerville 6, Port Mourant, will not be ready until the following year.

14. A distance-of-planting experiment has been started in Field 6 West, Sophia.

Indicator : S.C. 12 (4).
Formulae : (1.) Rows 3 ft. from centre to centre.
(2.) Rows 4 ft. from centre to centre.
(3.) Rows 5 ft. from centre to centre.
(4.) Rows 6 ft. from centre to centre.
All rows two feet wide, banks (or interrows) varying, according to formula, from 1 to 4 ft. 36 cuttings used per row across a bed 36 ft. wide.
Type : Seven Randomised blocks, plots being 0.07 acre in area.
Planted : July 8, 1930, to be reaped October, 1931.

15. An experiment with bamboo underdrainage and open drains across the bed (bed drills), in addition to the usual open drains, has been started in Field 9 West, Sophia :—

Indicator : D. 625.
Formulae : (1.) Control.
(2.) Bamboos with unpierced septa laid at the bottom of ditches 2 ft. deep and 1 wide and recovered with trash and soil.
(3.) Bamboos with pierced septa laid as in No. (2).
(4.) Open ditches 2 ft. deep and 1 wide, across the beds.
(5.) Open ditches 1 ft. deep and 1 wide, across the beds.

Ditches for bamboo and open ditches are at right angles to open drains and occur every 10 feet.

Type : Two Latin Squares of 16 plots each, only one type of open ditch occurring in each square. Plots 0.06 acre in area.
Planted : September 18, 1930, and to be reaped as plants in November, 1931.

16. A pot culture trial has been started in co-operation with the Chemist-Ecologist. Its object is to throw some light on the problems connected with flood-fallowing with and without green manuring and in the presence or absence of limestone to the full lime requirement of the soil.

17. The Adco manures made from rice straw and cane trash, respectively, have been applied to beds planted to D. 625. There was not enough material to make a quantitative test but the plots laid out should form a useful quantitative trial.

18. Soil samples have been taken from all the fields on which experiments have been laid down. These have been submitted to the Chemist-Ecologist. In connection with certain investigations being carried out by this officer, samples of soil water are submitted to him fortnightly. A special series of 24 composite soil samples from the bamboo drainage experiment in Field 4 West, Sophia, has been sent to the Chemical Division.

19. For the formation of nurseries on the estates and in connection with the establishment of the variety experimental trials, the following were distributed during the year :—

S.C. 12 (4)	78,000 cuttings.	B.H. 10 (12)	62,000 cuttings.
D. 835/18	31,000 ,,	D. 351/20	15,000 ,,
D. 73/20	18,000 ,,	D. 557/20	12,000 ,,
D. 628/20	13,000 ,,	Bourbon	7,000 ,,
D. 666/18	8,000 ,,	D. 611/18	5,000 ,,
D. 679/20	5,000 ,,	D. 621/18	5,000 ,,
D. 794/18	5,000 ,,	D. 602/22	4,000 ,,
D. 118	3,000 ,,	D. 689/13	3,000 ,,
P.O.J. 2727	3,000 ,,	P.O.J. 2727	3,000 ,,
D. 695/13	3,000 ,,	D. 421/18	3,000 ,,
D. 203/20	2,000 ,,	Diamond 10	2,000 ,,
P.O.J. 2714	1,000 ,,	P.O.J. 2878	218 ,,
D. 53/27	430 ,,		

This year's distribution of 1,998 bags of cuttings is about double that of any previous year. In addition small quantities of cuttings, arrow fluff, etc., were sent to kindred institutions abroad.

20. Fifty-four puntloads of unwanted cane were sold to Pln. Ogle. The revenue served to increase the income of the Station by $296.09. Owing to the drought during the months of September to mid-December the navigation level became so low at Ogle that it was found impossible to take the "end of the year" canes from Sophia. Their reaping has therefore been deferred until the Spring of 1931.

21. Seed of the following legumes, useful as green manures and cover crops, was distributed in small quantities during the year :—

Crotalaria Striata.
,, *Usaramoensis.*
,, *Duncea.*
,, *Sericea.*
Dilichos lablab.
Bengal Bean.
Victor Cow-pea.
Troit ,,
Conch ,,
Feterita ,,
Desmodium tortussum.
Mimosa invista.
Woolly Pyrol.
Black creeping gram.
Indigofera Hirsuta.
Indigofera ?
Tephrosia Hookeriana.
,, *Candida.*
Yokohama, *Arlington*, 46448 & 70923 } Varieties of *Stizolobium* sp.

Documentation, Visits, Etc.

22. The card indexing of periodic sugar literature, plant distribution, and the records of varieties, was satisfactorily kept up during up the year.

23. The Station staged varieties of sugar cane diagrams, experiments being conducted at an exhibition held in the Promenade Gardens by the B. G. Workers' League. A large number of visitors sought information as to the work in progress.

24. A circular calling attention to the possibility that sledges may be substituted for the "heading out" of cut cane, has been prepared and distributed locally.

25. In conjunction with the Immigration Agent General and the Chairman of the Local Government Board, a report on the Sugar Industry was prepared and a lengthly memorandum was also submitted in connexion with the subsidiary recommendations made by the West India Sugar Commission.

26. The Agronomist is co-operating with the Agricultural Superintendent, East Demerara, in an enquiry into the cane-farming industry. In this connexion, the farmers have been met at Beterverwagting, Buxton and Rose Hall, Corentyne.

27. The Agronomist, Field Manager and Field Assistant paid some 60 visits to various sugar estates during the year. Many of these visits extended over several days, especially when there was experimental work to be done.

28. The many courtesies extended to the Station and Staff by Managers and the personnel on sugar estates are greatly appreciated.

29. A number of planters and other interested persons visited the station during the year. Among the visitors were His Excellency Sir Edward Denham, Professor F. Hardy, Colonel I. Davson and Sir F. J. Clarke.

30. It is a pleasure for the writer to record his keen appreciation of the zealous co-operation given him by the Staff of the Sugar Experiment Station.

C. HOLMAN B. WILLIAMS,
Cane Agronomist-in-Charge.
31.12.30.

DEPARTMENT OF AGRICULTURE.

REPORT ON THE BOTANIC GARDENS FOR THE YEAR 1930.

REPORT ON THE BOTANIC GARDENS FOR THE YEAR 1930.

Staff.

E. B. Martyn, B.A. (Oxon.)—Superintendent of Gardens.
H. A. Cole —Horticultural Assistant.
G. L. Leitch —Clerical Assistant.
M. Sheriff —Nursery Foreman.

General.

The working of the Gardens has been carried out throughout the year as funds permitted. The weekly paysheet includes on an average some 50 regular employees at the Botanic Gardens, together with seven at Government House and the Public Buildings.

2. It is to be noted that the supply of Prison labour throughout the year was very uncertain. A regular gang, even though small, would be of considerable assistance in maintaining the Gardens in proper order.

3. The following table shows the amounts spent under the different votes :—

	Vote.	Expenditure.
Botanic Gardens Maintenance ...	$ 5,000 00	$ 4,978 37
Purchase Production and Distribution of Seed	3,000 00	2,990 49
Cutting Grass for Police Horses ...	1,100 00	1,094 17
Control of Antidesma	300 00	292 43
Georgetown Government House and Public Buildings	1,600 00	1,596 80

4. The weather during the year passed from one extreme to another, abnormally heavy rain in the middle of the year being followed by over four months dry weather, at the end of which the question of an adequate water supply was becoming serious.

5. The installation of a pipe line water supply for the Gardens was mooted during the year. Such a system would certainly be of great help during the dry months, when at present all watering must be done by hand.

Front Garden.

6. All bushes and shrubs were trimmed in the middle of the year. The massing of shrubs in the various beds has been continued according to plan, and there are now a series of beds planted with but one variety of shrubs in each. The results obtained, however, are somewhat disappointing, for although a good display of colour is apparent while any particular shrub is in flower, the major majority of the time the bed consists of a mass of unrelieved greenery. Exceptions to this are to be seen in the Croton bed, and the Plumbago bed, the latter flowering off and on throughout the year.

7. The Poinsettias, which have been planted at intervals around the circular bed in the avenue, should make a good display in a year or so. The Petrea beds west of No. 1 lake were a fine sight at the end of the year.

8. In order to relieve the monotony of the stretches of grass, a number of circular beds have been made on the lawns, and planted with Zinnias, Asters, Coleus, etc. Some small beds have also been made around the base of certain of the palms, and planted with Salvias, Torenias, etc. These serve the double purpose of adding colour to the Gardens and helping to keeping the soil at the base of the palms in good condition.

9. Two new Canna beds have been made in the South section, and planted with a number of different varieties. Six plants of a dwarf species of Erythrina have been planted at intervals along the path leading to No. 1 island. A clump of bamboos at the West end of No. 1 lake, which died, was removed and replaced with a bed of Ixoras. The clumps around the East end of No. 3 lake have been cut back.

10. The borders have been attended to as was necessary, and have been planted with a succession of different flowers including Zinnias, Portulaca, Bachelor's Button, Salvias, Asters, Cockscomb, Coreopsis, Balsam, Vinca, Coleus, Carnations, Torenias, Cannas, etc. A good display was maintained. Some trouble was experienced from the depredations of crickets on newly planted seedlings, but Paris Green proved an effective remedy.

11. The ornamental pots in the neighbourhood of the front office and bandstand have been changed from time to time, a series of different plants being alternated in them. The appearance of the bandstand has been improved by placing a number of palms in tubs around it, and some hanging ferns are also displayed on "band days." The seats around the bandstand, etc., have been repainted.

12. A number of creepers have been planted around the Meteorological Observatory and along the fence behind the D'Urban Park Race Club.

Lawns.

13. These have been cut regularly. The Director of Agriculture's lawn and tennis court have received periodic attention throughout the year, and have been maintained in order. The latter was successfully treated with worm-killer during the wet season. During the dry weather at the end of the year the stretches of lawn bordering the main avenue, etc., cracked badly. The cracks were filled up as far as was possible.

Park Lands.

14. The trenches and Nymphea ponds in this section have been cleaned from time to time, and the "bush," especially the Antidesma, has been cut back and burnt. Eradication of Antidesma by poisoning was in progress at the beginning and end of the year, and the Northern half of the Gardens is now practically cleared of this weed. The extermination campaign will now, however, have to cease, owing to lack of funds.

15. A species of white Nymphea from the Lamaha Conservancy has been established in one of the ponds on the Southern section of the Serpentine Road. The plants of *Cassia fistula* planted along the bank of the first blue lily trench having failed, they were replaced by *C. Javanica*, which appears to be hardier.

16. A new plan has been made of the trees in the avenue, the original plan being now quite out of date and portions of it destroyed. The avenue alone contains 204 species of trees and palms. It is hoped eventually to complete a plan of the whole Gardens. The labelling of trees with the labels obtained last year was completed.

17. A section of iron fencing around the lakes in the Southern section was removed, and used to repair the fencing around the buffalo paddock.

18. The pond near the cow-pen was emptied in so far as was possible and cleaned, as also were the irrigation channels leading to it. This was done at the end of the dry weather, in December

Carts and Harness.

19 A shed with a thatched roof was built behind the cow-pen to protect the carts from sun and weather, which in the past have done much harm to the paint and woodwork.

20. Various repairs to the carts have been necessary throughout the year. In addition, several new pieces of harness have been purchased for the animals, the old harness being in a very bad condition.

Roads.

21. The condition of the roads became very bad during the wet weather in the middle of the year. Patching with granite proved expensive, and not very satisfactory. If the stone be used to fill bad patches the majority of it soon sinks out of sight, and the remainder on the surface does not bind, but eventually breaks up and becomes scattered over the road. The surface drainage of the main avenue and the road leading to the cow-pen was improved by cutting a series of drains to take the water off. The condition of the latter road was especially bad, and the deepest holes were filled with stones obtained from the remnants of a rock garden in the Nursery.

22. A small heap of earth was burnt in September, and used to patch the worst portions of the road when the rains began again at the end of the year.

Nurseries.

23. *Ornamental Section.*—The appearance of this was considerably improved by the spreading of thirty barrels of shell upon the paths.

24. The greenhouse was found to be in a very bad state of repair. Complete renewal was suggested, but would have proved too expensive. Extensive repairs therefore had to be carried out to the shelves on which the plants rest, and to the roof, which leaked badly. New panes of glass were provided for the latter.

25. A collection of different varieties of Hibiscus is being made, and 24 varieties recently brought from Trinidad by the Entomologist on his return from leave should prove a valuable addition. It is intended to establish a bed in the Gardens, planted with varieties of Hibiscus.

26. Budding of Roses was held up during the latter part of the year by the persistent dry weather.

27. A seed trough was planted with Eucharis lilies in order to provide a number of these for ornamental purposes.

28. The collection of orchids was re-arranged during the year; a number of plants were re-basketed, and attention was paid to the labelling of others. The plants appear to be in a vigorous condition, but despite this only some two-thirds of the species in the collection flowered during the year. An attempt is now being made to remedy this by transferring some of the plants to Wallaba blocks, rather than basketing them.

29. The following orchids were reported as flowering during the last 10 months of the year.

Aerides odoratum	—July.
Bletia paetula	—October, November.
Brassia caudata	—March, June.
B. Laurenciana	—May, August.
Cattleya Bouringiana	—May-August, November, December.
C. Jenmanii	—July, October.
C. labiata	—March.
C. labiata var. Gaskelliana	—June, October.
C. labiata var. Mossiae	—May, June, August.
C. labiata var. trianae	—July.
C. Schroederiana	—July.
C. Skinneri	—March-May.

Coryanthes macrantha —August.
Cymbidium pendulum —June, October.
Dendrobium aggregatum majus —November.
D. chrysotoxum —April-June.
D. lituiflorum —May.
D. Moschatum —August, December.
D. nobile —May.
D Phalaenopsis —April.
D Pierardii —April, May.
D. Superbum —March, April, October.
D. transparense —April.
Epidendrum ciliare —March, June-August, October-December.
E. fragrans —March, April, October, November.
E. osmanthum —March, April, October.
Exylobium sp. —March, April.
Gongora atropurpurea —August.
G. quinquinervis —March, December.
G. Nigrita —November.
Ionopsis teres —April.
Miltonia spectabilis —August, September.
Maxillaria sp. —May-July.
Oncidium altissimum. —March, April.
O. ampliatum —April.
O. Lanceanum —November.
Phalaenopis amabilis —March-May.
P. Esmeralda Regnerii —April, May, August, October.
P. Schilleriana —April.
P. Stuartiana —March, April
Renanthera coccinea —March, April, June, July, December.
Rodriguezia secunda —April.
Schomburgkia Lyonsii —November.
Sobralia sessile —October.
Stanhopea eburnea —May, June, October.
Zygopetalum sp. —July.

30. An exchange of Orchids was made with a collector in the Panama Zone and the following plants received :—*Aspasia epidendroides, A. principissa, Bletia purpurea, Bulbophyllum vinosum, Camaridium ochroleucum, C. latifolium, Catasetum scurra, Cattleya Deckerii, Cycnoches diane, Cypripedium longifolium, Dichea panamensis, Epidendrum atropurpureum, E. difforme, E. Stamfordianum, Eulophia alta, Hexisia bidentata, Ionopsis utricularioides, Lokhartia mirabilis, L. pallida, Lycaste Powellii, Mormodes atropurpureum, Odontoglossum sp., Oncidium carfusum, O. panamensis, O. sp. (cerocroprum ?), Peristeria elata, Sobralia Bouchei, S. epiphytica, S. panamensis, S. sp., Stanhopea bucephalus, Trichophilia maculata, T. sp., Trigonidium Seemanii.*

31. These plants have all been attached to Wallaba blocks. They were received towards the end of the year, and it remains to be seen how they will fare.

32. In addition, a number of orchids were collected locally in the bush by members of the Forestry Department and by the Government Botanist. None of these have as yet flowered.

33. *Economic Section* : *Citrus.*—Considerable attention has been paid to the raising of Citrus seedlings for budding. Some 23,888 sour orange seeds and 3,634 Grape Fruit seeds were sown during the year. Approximately 4,760 seedlings are now ready to be budded and in addition there are several beds containing younger plants. The seedlings in the seed troughs, and later when planted out in the beds, suffered rather heavy losses during the wet season, which was an abnormally heavy

one. (The rainfall for July was 21.02", a record.) When the rains stopped however, the seed beds were mulched with cut grass, and the seedlings subsequently grew vigorously. Some trouble was experienced from the attacks of crickets, but these were successfully combated by the use of a Paris Green mixture. Nut grass proved a somewhat troublesome weed in the Citrus beds, which needed constant cleaning on account of it.

34. During the year 284 budded Marsh Grape Fruit and 56 budded Duncan Grape Fruit were basketed. 220 Marsh Grape Fruit and 48 Duncan were sold, or distributed to the experimental Station. 302 orange seedlings were budded from the following varieties :—Parson Brown, Navel, Dancy, Valencia. 100 Grape Fruit seedlings were budded with Marsh Grape Fruit.

35. 273 budded oranges of the above varieties, together with Jaffa and Ruby, were basketed, and 191 of these were sold or distributed to the Experimental Stations.

36. Some budding was carried out on Rough Lemon Stock and Succadee Succadens stock, and the resulting plants are for the most part being retained by the Department, until it is known how these stocks will fare under local conditions.

37. *Mangoes.*—Steps have been taken to supply the grafted mangoes which have been ordered from different sources. 444 Mango seedlings were sown, and 113 grafts have already been made. 34 mangoes of the varieties Julie, D'Or, Mrs. White, No 11 and Mrs. Dare, together with Pere Louis, Julie, Gordon and Graham received from Trinidad, have been sent to the Experimental Station.

38. *Coffee.*—5,744 seeds of Liberian coffee were sown and 1,429 seedlings sold. A number of seedlings of the varieties Camphora, Excelsa, Robusta and DeWeeverii were discarded, as these are seldom in demand at present.

39. *Miscellaneous.*—12 budded Avocado Pears received from Trinidad were sent to the North West District, as also were 432 seedlings of British Honduras Mahogany.

40. *Fish Poison Plants.*— A collection of fish poison plants was made during the year, and specimens of the following were planted out :—Black and White Haiari (*Lonchocarpus spp.*), Yarroconalli (*Tephrosia toxicaria*), Conaparu (*Euphorbia cotinoides*), Daukanani (*Phyllanthus conami*), Conami (*Clibadium? surinamense*). Cuttings and seeds of all these were received from the North West District.

41. *Fruit Plants.*—A collection of one dozen of the Colony's typical fruit plants was shipped to Canada for the Exhibition at Halifax. These included Citrus, Mango, Papaw, Sapodilla, Semitoo, Pineapple, Star Apple and Guava.

42. A collection of fruit trees has also been planted on the Eastern side of the nursery, in order that the Gardens may be more independent as regards budwood of Citrus, and seeds of other fruit plants, supplies of which at present have to be obtained from outside. The trees planted include budded Marsh and Duncan Grape Fruit and budded Jaffa, Ruby and Dancy orange, on Sour Orange and Grape Fruit stock. Also one Parson Brown and one Valencia orange on Rough Lemon Stock, and one Parson Brown orange on Succaddee Succadens Stock. In addition, specimens of Genip, Soursop, Golden Apple, Governor Plum, Star Apple, (white and purple), Pomegranate, Breadnut, Mammee Apple and Sapodilla were also planted out.

43. The following tables indicate the activities of the Gardens during the year:—

TABLE I.

	Economic section.	Ornamental section.
Plants bedded out ...	6,714	12,154
Plants basketed or potted ...	6,868	5,213
Plants re-basketed or re-potted...	3,762	1,805
Plants grafted or budded ...	736	...
Plants ringed ...	...	484
Plants top-dressed ...	1,422	1,452
Seeds sown (apart from packets)...	9,195	365

TABLE II.

PLANTS SOLD OR DISTRIBUTED.

Economic Section.		Ornamental Section (since June).	
Marsh Grape Fruit ...	220	Maiden-hair Ferns ...	200
Duncan Grape Fruit ...	48	Ferns ...	39
Budded Orange ...	191	Rose Plants ...	24
Grafted Mangoes ...	97	Palms—	
Liberian Coffee ...	1,429	Licuala grandis ...	200
Cocoa ...	359	Chrysalidocarpus lutescens ...	76
Sappodilla ...	149	Ptychosperma Macarthurii ...	49
Nutmeg ...	92	Caryota mitis ...	57
Golden Apple ...	63		
Semitoo ...	71		
Papaw ...	118		
Miscellaneous ...	332		

TABLE III.

REVENUE RECEIVED DURING THE YEAR 1930.

	Sale of Plants.	Sale of Bamboo.	Sale of Lilies.	Hire of Plants.	Miscellaneous sale of pots, seeds, bulbs, fruits, cuttings; package, etc.
January	$ 33 82	$ 4 68	$ 60	$ 4 56	$ 4 62
February	40 31	2 38	1 64	1 44	4 86
March	27 13	3 39	1 32	96	3 18
April	48 40	1 49	2 12	92	68
May	46 48	2 01	8 30	96	4 84
June	29 56	7 90	5 12	3 60	2 04
July	16 26	5 12	5 20	...	2 61
August	20 52	1 33	2 76	48	77
September	33 14	4 04	7 70	96	86
October	25 72	3 13	7 50	...	64
November	38 48	3 93	1 94	96	1 12
December	57 84	8 33	2 64	4 24	1 38
Total	$ 417 66	$ 47 73	$ 46 84	$ 19 08	$ 27 60

TOTAL ...$ 558 91

GOVERNMENT HOUSE AND PUBLIC BUILDINGS.

44. The lawns and flower beds were maintained in order throughout the year. The borders at Government House were supplied periodically with seedlings from the Gardens, and additional plants and flowers were provided for decorative purposes when necessary. The tennis lawns were successfully treated with worm-killer.

45. The extension of the vegetable garden at Government House proved very satisfactory, and the good crops of vegetables produced did credit to the head gardener and his staff.

E. B. MARTYN,
Superintendent, Botanic Gardens.

January 14, 1931.

BRITISH GUIANA.

DEPARTMENT OF AGRICULTURE.

PART III.

BUSH LOT LAND SETTLEMENT REPORT.

REPORT ON THE BUSH LOT LAND SETTLEMENT, ESSEQUEBO, FOR THE YEAR 1930.

SIR,

I have the honour to submit my report on the Bush Lot Land Settlement and Anna Regina properties for the year ending December 31, 1930. This report follows on from my report as Chief Colonization Officer for the year 1929 (C.S.O. No. 1219/30).

2. Sir Gordon Guggisberg's protracted illness in England and the unexpected delay in receiving authority for the completion of the scheme resulted in work on the whole project being temporarily suspended during the latter part of 1929. Eventually, however, the constructional phase of the scheme as originally proposed ended on June 30, 1930, although it was possible to commence settling of families from April 1, 1930. This was essential in order to prevent loss of another year in launching the scheme, since preparations had to be put in hand immediately for the settlers to plant the rice crop to be reaped in the Autumn.

3. It is necessary to refer to this because few realised the position at the time, especially in regard to the importance of getting the full complement of settlers installed and the establishment of the rice crop, if the Settlement was to be economically run during the year. With only a partial Settlement, the cost of maintaining irrigation and drainage would have been inordinately high, and the lands which had already been laid out would have reverted to high bush, necessitating further expenditure later. The situation, therefore, demanded immediate action.

4. Arrangements had been made, in collaboration with the Immigration Department, to obtain the names of suitable East Indians as the first settlers. Printed notices in English, Hindi and Urdu were widely distributed, being placarded on all Post Offices, Railway Stations, Steamer Stellings, Magistrate Courts, public buildings, etc. Appendix III. of the 1929 Report sets out the guide terms.

5. From the outset, it was obvious that some difficulty would be experienced in securing the best types available. A factor that operated seriously in the matter was the late Governor's instructions in his Memorandum No. 1, Part V.—laying down the principles to be observed in drawing up schemes for land settlements. He wrote "Government must, in all fairness, rigidly avoid actively enticing from the "estates labour which the latter may have brought into the country at their own "expense." This rule was strictly observed. East Indians in villages being already for the most part in possession of land, it could hardly be expected to attract many of this class or even those working happily on estates. Recruitment was, therefore, by no means an easy task and the time in which to do it was limited for reasons already given in paragraph 2 *supra*.

6. No meetings were held by either the Agricultural Department or the Immigration Department with the object of inducing persons to come forward and settle on Bush Lot. Had meetings been held at villages in Demerara (where there are 20 estates) or in Berbice (where there are 10 estates) there would have been undoubtedly a complaint from sugar estates. Instead, on the first three days of every week, when large numbers of East Indians attend the Immigration Agent General's Office transacting business of various sorts, the notices were read and explained to all assembled by an Interpreter.

The number of applications sent through the Immigration Agent General, totalled 80 families, without going near an estate. Many of these intending settlers were inspected at Beterverwagting Police Station and at the Immigration Office on April 1, 1930.

PHOTOGRAPHS AT END OF REPORT.

7. The following summary gives in detail the numbers that came forward, the districts they came from, numbers that ultimately embarked for Essequebo, etc. :—

(1.) Sixty-five applications were received by April 1 as under :—

From Berbice	...	...	nil
Essequebo	...	...	3
Demerara	...	...	62
			— 65 families.

Subsequently withdrew or did not come forward for embarkation :

Essequebo	...	...	3
Demerara	...	...	34*
			— 37 families.
		Embarked ...	28 ,,

(2.) The 28 families above were despatched in five trips by steamer from Georgetown as under :—

April 1 ...	...	6 families	comprising	22 persons.
,, 4 ...	...	6 ,,	,,	19 ,,
,, 8 ...	...	2 ,,	,,	6 ,,
,, 11 ...	...	7 ,,	,,	29 ,,
,, 15 ...	...	7 ,,	,,	24 ,,
		28 families	comprising	100 persons.

(3.) The families that embarked came from the undermentioned estates and villages :—

Pln. Success, E.C.	...	9 families	comprising	32 persons.
,, L. B. Intention	...	2 ,,	,,	6 ,,
,, Ressouvenir	...	1 family	,,	3 ,,
,, Providence, E.B.	...	1 ,,	,,	3 ,,
,, Houston	...	9 families	,,	36 ,,
,, Ruimveldt	...	1 family	,,	3 ,,
Agricola Village	...	1 ,,	,,	3 ,,
McDoom Village	...	1 ,,	,,	3 ,,
Jonestown	...	1 ,,	,,	2 ,,
Met-en-Meerzorg	...	1 ,,	,,	5 ,,
Albouystown	...	1 ,,	,,	4 ,,
Total	...	28		100 persons.

(4.) Classified according to the districts of origin :—

12 families	comprising	41	persons	were	from	E.C., Demerara.
14 ,,	,,	50	,,	,,	,,	E.B., Demerara.
1 family	,,	4	,,	was	,,	Georgetown.
1 ,,	,,	5	,,	,,	,,	W.C., Demerara.
28 families	comprising	100	persons.			

* 28 of these resided at Plantation La Bonne Intention *cum annexis*.

(5) Heads of families classified according to whether Colony born or introduced from India :—

6 were men from India with Indian wives.
3 were creole men with Indian wives.
7 were men from India with creole wives.
11 were creole men with creole wives.
1 was a creole man with no wife.

(6.) Summary of the above persons :

13 men and 9 women had been introduced from India.
15 men and 18 women had been born in the Colony with 21 boys, 19 girls and 5 dependants.

(7.) The above persons took 7 cows, 7 calves, 2 sheep and 1 donkey with them to the Settlement.

8. After the despatch of this lot of settlers, fifteen more applications were received by the Immigration Agent General in respect of 62 persons as follows:—

3	applications	from	Pln.	Enmore	in	respect of	14	persons.
2	,,	,,	,,	Success	,,	,,	10	,,
1	application	,,	,,	Ressouvenir	,,	,,	4	,,
1	,,	,,	,,	Montrose	,,	,,	4	,,
6	applications	,,	,,	Brothers, E.C.	,,	,,	23	,,
1	application	,,	,,	Houston	,,	,,	3	,,
1	,,	,,		McDoom Village	,,	,,	4	,,
15	applications.						62	persons.

9. It is significant that up to this point only a single family was secured by the Immigration Agent in Essequebo, though at this time representations were being made to the Economic Investigation Committee in regard to East Indians in Wakenaam who were out of employment through the closing of Pln. Marionville. No applications at all came from Berbice, though the Agricultural Officer and the Immigration Agent General spared no efforts.

10. Apart from other causes, to the following also may be attributed the comparatively small number of families that had applied at this stage :—

(1.) Restrictions with regard to title, etc.
(2.) Rentals of the houses (East Indians of this class are accustomed to living in trash huts or estate ranges which latter are rent free).
(3.) Sufficient time was not available to advertise the Settlement.

The embarkations from Georgetown, nevertheless, had the effect of making the Essequebo coast residents realise that they were in danger of losing a good opportunity especially as sugar-growing had almost ceased to exist on the coast, and they now began to come forward in large numbers.

11. Eventually, the following families, their districts of origin included, were in residence on the Settlement for the first paddy crop :—

Families.	Persons.	Districts.
25	90	East Coast, Demerara.
3	7	West Coast, Demerara.
22	73	Hamburg, Essequebo.
25	104	Essequebo Coast.
2	4	Pomeroon
77	278	

See also paragraphs 14 and 15.

12. In a scheme of this description it will always be difficult to obtain the type of settler required at first as, generally speaking, the industrious and hardworking farmers already have homesteads of their own and are not likely to leave and take land elsewhere. It is, therefore, a case for selection by trial and error on the Settlement itself, under the guidance of an Agricultural Officer followed by the elimination of those unlikely to make good or not giving satisfaction. In this connection, the terms allowed for a probationary period of three years during which elimination may take place as circumstances arise. In spite of all obstacles, it is a pleasure to be able to record that the Settlement has now become firmly established.

13. The Colonization Committee which had been in existence since the initiation of the scheme was dissolved in May, 1930. Mr. L. M. Nightingale, who had been in charge of the Settlement during the survey and constructional periods, was transferred to the Local Government Board and was succeeded by Mr. A. DeK. Frampton, Agricultural Superintendent of the District, on May 10, 1930. Mr. Frampton took over these duties in addition to the district work, being assisted by an overseer and bookkeeper for the whole of the Anna Regina estates as well.

14. Settling of the families, as already stated, was commenced during the month of April and each family was allocated a house, garden allotment of one quarter of an acre and three acres of paddy land. Half an acre of provision land has also been included. The Settlement was officially opened by the Honourable C. D. Douglas-Jones, C.M.G., Officer Administering the Government, on May 7, 1930, with 70 families in residence. The majority of the members of the Legislative Council and many prominent members of the planting community were also present. A full account of the proceedings was reported in the Agricultural Journal—Volume III, No. 2.

15. During May and June, further houses and paddy lots were taken up, making a total of 77 families with a total area of 231 acres of paddy land, exclusive of garden allotments. Many more applications were received during the ensuing months, but it was decided that settlement could only be carried out in April and September, that is the beginning of the paddy crop seasons; in consequence, these applications were held up until after the close of the Autumn paddy crop. Eventually, the number of applications received totalled 150.

16. The health of the settlers has been fairly good throughout and has steadily improved as the families became settled. The chief complaint has been malaria, but with better drainage and gradual improvement in surroundings of the cottages, mosquitoes are now less prevalent than during the early stages. Visits are paid twice weekly by the Government Medical Officer, resident at Anna Regina; the district nurse also visits the Settlement. A medical survey of the settlers and their families was made by Dr. R. O. Sibley during August. This survey was a favourable one. A Crêche has been erected for the use of the children when their parents are at work. The greatest need at present, from the health point of view, is a pure drinking water supply. The supply of trench water is unsatisfactory and a scheme is now under consideration for supplying filtered drinking water, pending the sinking of an artesian well which has been unavoidably delayed. It is hoped to secure the provision required this year (1931).

17. In due course, preparation of the rice beds commenced and pure line selected paddy seed of the Demerara Creole variety was available for sowing. Some difficulty was experienced as all the previously uncultivated areas were, by this time, becoming covered in heavy grass and bush growth. Further, on the completion of this work it was found that many of the paddy beds were insufficiently levelled for successful cultivation and irrigation purposes. This had to be rectified before final preparation for planting could proceed. In the meantime, nurseries had been prepared and ploughing commenced by those who owned ploughing

steers. The remainder of the settlers with no steers were unable to make a start and, as working the lots by hand would have taken far too long, it was necessary to make advances for purchase of steers on the basis of one pair between two families. Eighteen pairs of steers were subsequently purchased and the price paid was charged against the Settlers' Advance Account.

18. The nurseries were all set in good time but, unfortunately, wild ducks (Vicissi) did considerable damage at night and, in many instances, resowing had to be done as many as three times. This caused considerable anxiety, resulting in the late establishment of the crop. Seedlings were eventually set out during July and it meant considerable pressure and supervision to get the work completed.

19. Two weedings were given to each settler's area and, at the completion of this, the problem was to find employment for the majority before harvesting operations commenced. This was specially necessary in view of the fact that many of the settlers arrived with no capital and if paid labour or subsistence was not provided they would naturally have proved an easy prey for money-lenders, etc. Unfortunately, it was impossible to find work for the majority for which they would be paid, anywhere along the coast, and subsistence allowance was granted on the condition that they worked in their gardens and kept their house lots tidy. A number obtained temporary employment with the Public Works Department and doing trench cleaning, etc., on the property. The amount thus earned in wages during the year was $1,781.85. Towards the end of July the rains ceased and a prolonged drought set in. On account of this, approximately 60 per cent. of the rice crop had to be grown on irrigation water alone. Due to defects in the kokers it was difficult to maintain a sufficient head of water to irrigate the whole area and to keep the beds submerged, as is essential. In consequence, the growth of the paddy in some of the later planted beds and on some of the higher beds was unsatisfactory. This affected the yields considerably. Evaporation was also excessive during the hot months of August and September. In spite of these drawbacks, but stimulated by a paddy growing competition in which all the settlers took part, there was sustained effort in maintaining the cultivations throughout.

20. Harvesting operations commenced during the last week in October, under ideal weather conditions and, in spite of the lateness in planting, the crop harvested was of an excellent, uniform quality. No advances were given at first for this work and the settlers started to work communally. This proved to be too slow, however, and with the rainy season approaching, advances were made to enable the employment of outside labour and so speed up the work. On completion of threshing in the field, the paddy was transported to the Anna Regina factory in cane punts. Taken as a whole, the yields were fairly satisfactory considering the unfavourable weather prevailing during the growing period. The highest amount obtained by any one settler was 69 bags (from 3 acres) whilst the greatest yield from one acre was 30 bags. There is no doubt that had the weather been more showery during the growing period, especially at the time when the grain was forming, the yields throughout the entire section would have been much higher. The total yield obtained from the 231 acres was 3,809 bags of 150 lbs. each, an average of approximately 17 bags per acre. The crop was sold to a Georgetown firm, delivered at the Anna Regina Factory, at seven shillings per bag, the buyers providing bags. This was two shillings more per bag than the local district price. This result enabled advances, rents, etc., to be collected and, after these deductions were made, only a few settlers are carrying over values in stock to the extent of $584.50 in respect to the animals purchased for them.

21. After the completion of the harvest it was found necessary to remove those settlers who had not given satisfaction and would be a hindrance to the Settlement. The vacancies, however, have all been filled, after careful selection, and the Settlement is now at full strength of 81 families, or a total of 317 souls--

106 men, 76 women, 67 boys and 68 girls, many of whom have reached working age and are assisting their parents. Special steps are being taken to deal with the Child Welfare and Maternity cases in the Settlement where a Clinic has been established which is visited by the District Nurse. Arrangements are being made for the provision of infant foods, milk, etc.

22. Attention was now directed to the preparation of the spring crop for 1931. The prolonged drought, however, which was most beneficial for the harvesting of the Autumn paddy crop, adversely affected the water supply for irrigating the paddy fields. At the end of October the Tapacooma conservancy had become very low and by December practically no water was flowing down the main water path. Since all the water supply for the Settlement area for irrigation purposes comes from the conservancy, and as it was already late, the Spring crop for 1931 at Bush Lot had to be abandoned. The settlers are, therefore, concentrating their efforts on ground provision crops of which each settler is cultivating half an acre. The crops grown are plantains, black-eye peas and the usual ground provision and other saleable crops.

23. Attention is also paid to the gardens on their house lots. A model garden was laid out at the Settlement for the purpose of demonstration and at the same time to provide seedlings and planting material for distribution. This garden has proved most useful and tomato, onion, egg plant, other seedlings and cuttings have been distributed to each of the settlers. Thus, the house lots should produce some saleable produce and also supply a certain amount of food for the settlers themselves. The provision farms will also provide them with a quick saleable catch crop in black-eye peas before the ground provision crops come into bearing.

24. The cattle owned by the settlers comprise 54 milch cows, 98 working steers and 74 calves—a total of 226. The milk supply from the cows is more than sufficient for the Settlement and some is sold outside. The milch cattle have been provided with a small fenced pasture to the south of the Settlement and are fed mainly on cut grass. If funds are available in 1931 a milking shed and a calf-pen will be erected.

25. To sum up, satisfactory progress has been made since the arrival of the first settlers. The paddy land is now all in good working order and irrigation facilities have been greatly improved by the use of plank weirs to raise the height of water in order to irrigate the high land. A new intake koker has been constructed in the backdam and this has also improved the irrigation considerably. The gardens on the house lots have also shown great improvement recently—it was essential as previously stated, to concentrate first on the paddy crop in the early months of the venture—and the settlers are now becoming interested in this work. A garden competition was held during the year which helped to stimulate it. Gardening was entirely new to many of them and it was some time before they understood the value of it.

26. Minor additional work had to be done on the houses during the year. It was found that the weather ends leaked very badly during heavy rains, caused by the warping of some of the crabwood boards. All the weather ends of the houses have now been shingled while the provision of verandahs on one side is contemplated during 1931.

27. Another requirement of the Settlement is a shop. At present the nearest shop is at the Anna Regina estate yard and the settlers have petitioned for a shop on the Settlement itself. It is, therefore, proposed to start a co-operative shop as soon as the families are in a sound enough financial state to operate one.

28. In addition to the Bush Lot settlers, there are over 200 persons cultivating paddy and ground provisions on the other Anna Regina properties to be cared for. These have benefited greatly from the general activities connected with the

Settlement, the use of pure line seed paddy and the participation, in most cases, of the good prices obtained for the paddy crop. This is reflected in the revenue for rents, etc., from these lands, collected during the year, which nearly doubled that of the previous year. In consequence, further extension of the cultivations on the estate as a whole is being considered.

29. I attach herewith a statement of expenditure from the Colonization Fund and Revenue added to the Fund during the years 1929 and 1930, which indicates that the position as at December 31, 1930, is as follows:—

Gross expenditure on Settlement Schemes...	...$	151,181 35
Further expenditure charged against the Fund	...	21,551 01
	$	172,732 36
Less revenue paid into the Fund ...	...	13,962 53
Net reduction of Fund	...$	158,769 83

30. The sum of $9,066.53 was repaid to the Colonization Fund during 1930 in respect of the temporary charge for Plantation Henrietta and the cost of fencing and conditioning this estate.

31. Construction work on the "Bush Lot Land Settlement Scheme" ended on June 30, 1930, the actual expenditure thereon amounting to $44,168.26, as against expenditure originally estimated at $48,339.

32. The financing of the Rice Mill at Anna Regina during November, 1929, to January, 1930, resulted in an apparent loss of $550.49 (C.S.O. file No. 4539/30). A part of this loss, however, was due to the cost of putting the Rice Mill in working order

33. The "Advances to Settlers Account" shows a net debit balance of $548.50 which is more than covered by the value of steers on the property. Transactions in respect of 1930 were as follows:—

Payments to Settlers—1930 ...		...	$ 6,496 91
Add final payments due for padi ...		...	107 30
		$	6,604 21
Less cash paid into Treasury for padi ...		...	5,580 71
		$	1,023 50
Deduct value of steers taken over from Settlers who have left ...	$ 399 00		
Value of padi reserved for sale to new Settlers ...	40 00		439 00
Balance due		... $	584 50

After deducting sums due, the best and most industrious settlers received fairly substantial sums in cash, *e.g.*, Dukhie $106.15; M. Napi $98.06; Raghoobir Singh $83.15. In addition to this transaction on behalf of the Bush Lot settlers, the Anna Regina tenants received $3,254.40 in cash for the padi marketed for them, besides other moneys received for padi marketed on their own.

34. It should be pointed out that this favourable financial statement is made available at this early date, by reason of the fact that the whole of the padi on the properties was disposed of at more than average prices, and paid for by the end of the year. Further, it will be readily seen what a substantial benefit this development has conferred on the cultivators and small traders of the district, especially as the sugar industry in that area no longer exists.

35. Viewed in the light of what the Bush Lot experiment was primarily designed to show the following may be of interest at this juncture:—Keatinge reported (paragraphs 88, 89, 90, page 206 of Report dated October 9, 1922):—

> "I consider that the climate and natural characteristics of British "Guiana are such as to offer splendid opportunities for Indian "immigration, and that there are likely to be great possibilities in the "future for Indian settlers to obtain fertile land and become substantial "peasant farmers.
>
> "At present however, though unoccupied land is available to an "unlimited extent, the physical and economic conditions which govern the "agricultural situation are such that it is hardly possible for ordinary "Indian immigrants to take up land and cultivate it with success imme-"diately on arrival in the Colony.
>
> "I believe that it would be quite possible to make available large "arears of land for the purpose of settlement by Indian Agriculturists, "and to call into existence the organization necessary in order to secure "this result and to give settlers the assistance which they would need to "tide them over their initial difficulties. The inauguration of such a "scheme would be very beneficial both to India and British Guiana."

Sir Gordon Guggisberg stated in Governor's Memorandum of October 20, 1928—paragraphs 17 and 18:—

> "India, hitherto our main source of supply of Immigrants, has been "closed to us. Immigration from that country, or any other, cannot be "re-opened until British Guiana has given practical proofs that she has "put into actual execution a satisfactory Land Settlement Scheme and "entirely divorced from any labour supply that may be started.
>
> "Once we can shew that for families received we can exchange good "farms, good housing, good health conditions and better prospects for the "immigrant than he can obtain in his own land, we shall certainly attract "tens of thousands of people from the over congested, and often plague, "famine, and cyclone stricken countries of the Empire."

Mr. A. H. Hill, Immigration Agent General, recently wrote:—

> "The way I regard things is, that this Colony only offers inducements "for settlement to immigrants from countries where wages and the "standard of living for labourers is lower than British Guiana. India "presently fills the bill. Any immigrants we may succeed in getting "will arrive with no money whatever. Successive delegates from India "have told us as much and, that immigration from that country will not "be permitted unless prepared land, houses, &c., are there ready for "intending settlers to enter into occupation of. Bush Lot—as I regard "it—is our first experiment in ascertaining whether land settlement on "these lines is worth the expense involved. The people secured for this "settlement were for the most part without capital, and therefore would "be analogous to the class of immigrants we must expect to get. If it "can be demonstrated that land settlement on the lines laid down by the "Government of India and, with persons without capital, is possible, the "problem of populating the place which all clamour for, is solved. If the "matter of population is vital every cent spent in trying it out is well "spent."

An impartial judge, after seeing what has been accomplished in the first year, cannot but conclude that the experiment is worth all the time, thought and energy which has been expended on it.

36. In concluding the report, I should like to express my appreciation of the help rendered by the Immigration Department and by the Immigration Agent General in the early stages of the Settlement.

37. His Excellency the Governor visited the Settlement on July 30, 1930,* when all details of the scheme were carefully investigated by him. After noting the difficulties encountered, and giving helpful suggestions, His Excellency was pleased to express his personal satisfaction with, and the thanks of Government for the work carried out.

I have, &c.,

J. SYDNEY DASH,
Chief Colonization Officer.

Department of Agriculture,
British Guiana,
February 24, 1931.

* His Excellency again visited on January 12, 1931.

SUMMARY OF EXPENDITURE FROM COLONIZATION FUND DURING 1929 AND 1930.

	Expenditure 1929.	Expenditure 1930.	Total Expenditure.
Properties	$ 86,850 00	...	$ 86,850 00
Administration	3,900 16	$ 920 00	4,820 16
Bush Lot Land Settlement Scheme ...	34,951 41	9,216 85	44,168 26
Bush Lot Scheme—upkeep of ...	...	1,172 59	1,172 59
Maintenance—Anna Regina and Richmond...	2,429 81	7,681 61	10,111 42
Main drainage works	...	2,401 30	2,401 30
Miscellaneous expenses	976 01	681 61	1,657 62
	$ 129,107 39	$ 22,073 96	$ 151,181 35

Recapitulation.

Gross expenditure on Settlement Schemes 1929–1930 ...		$ 151,181 35
Further expenditure charged against the Fund ...		21,551 01
		$ 172,732 36
Less revenue paid into Fund...		13,962 53
Net reduction of Fund		$ 158,769 83

EXPENDITURE FROM COLONIZATION FUND FOR 2 YEARS 1929 AND 1930.

	1929.	1930.
PROPERTIES—		
Plns. Anna Regina and Richmond	$ 75,000 00	...
Bush Lot	11,850 00	...
	$ 86,850 00	
ADMINISTRATION—		
Remuneration to Chief Colonization Officer	$ 600 00	$ 400 00
Remuneration to Accountant	240 00	160 00
Salary—Steno-typist	330 00	360 00
Salary and travelling, Chemist-Ecologist	2,730 16	...
	$ 3,900 16	$ 920 00
BUSH LOT LAND SETTLEMENT SCHEME—		
New Intake Koker at Lamaha Canal	$ 501 08	$ 112 38
Plank Weirs in Irrigation Canal	350 41	242 38
Roads—4,400 ft. of	835 29	1,285 57
Bridge over main drainage facade trench	353 69	Cr. 23 38
Bridge over navigation canal	383 34	56 65
Bridge over drainage trench into village	163 05	102 05
9,000 ft. cart track to back-dam	167 64	230 87
Converting lands into rice beds between reef and cross dam	2,883 08	657 75
Converting rubber cultivation into rice beds	3,679 96	207 84
Erection of houses—labour (85)	4,339 13	2,037 44
Erection of houses—material (85)	16,589 87	1,095 01
Levelling and grading house lots	1,186 22	181 74
Internal roads on reef	1,848 00	775 24
Fencing pasture	411 22	237 96
Cost of survey and paaling off	172 97	...
Minor works and contingencies	110 02	1,150 33
Clearing sand reef	500 00	...
Clearing rice lands	...	513 15
Expenses—settling families	...	227 14
Drainage and Irrigation Assessment	476 44	126 73
	$ 34,951 41	$ 9,216 85
BUSH LOT SCHEME—UPKEEP OF	...	$ 1,172 59
MAINTENANCE ANNA REGINA AND RICHMOND—		
Anna Regina—Staff	$ 679 52	$ 2,087 44
Anna Regina—Contingencies	1,440 17	4,016 03
Empoldering area factory and estate houses	310 12	889 06
Drainage and Irrigation Assessment	...	689 08
	$ 2,429 81	$ 7,681 61
MAIN DRAINAGE WORKS—		
Check Sluices at Richmond and Bush Lot	...	$ 2,158 00
New Intake Koker at Lamaha	...	243 30
		$ 2,401 30
MISCELLANEOUS EXPENDITURE—		
Expenses—closing down Barbados Agency	$ 56 85	..
Repatriation of Barbados Immigrants	...	30 00
Expenses—collection of rice rents	40 91	...
Insurance premiums Anna Regina estate	143 56	...
Stationery and printing	93 83	171 61
Investigation of drainage at Bush Lot and Henrietta	111 60	...
Rest House at Mabaruma	529 26	...
Purchase of bags for handling padi	...	480 00
	$ 976 01	$ 681 61
Total Expenditure	$ 129,107 39	$ 22,073 96

FURTHER EXPENDITURE CHARGED AGAINST COLONIZATION FUND.

Letter "C" Plantation Hague... ...	$ 5,000 00	
Anna Regina—Block "A"	13,500 00	
Empoldering Block "A"	1,030 96	
Furniture, Settlement Officer's Quarters ...	510 75	
Re-conditioning Commissioner's Quarters, Anna Regina ...	42 61	
		$ 20,084 32
Rice Milling Account, Anna Regina (loss on)		550 49
Advances to Settlers' Account (gross)		916 20
		$ 21,551 01

REVENUE CREDITED TO COLONIZATION FUND FROM ANNA REGINA AND BUSH LOT DURING 1929 AND 1930.

Classification.	1929.	1930.	Total.
Bush Lot and Henrietta land rents ...$	629 07	...	$ 629 07
Bush Lot Settlement Scheme—rents ...	...	$ 714 75	714 75
Anna Regina—General revenue ..	143 50	537 02	680 52
Anna Regina—Rice bed rents ...	997 86	1,578 90	2,576 76
Anna Regina—Pasture and Provision Farm rents...	69 80	461 19	530 99
Anna Regina—Electric light rents ...	48 20	97 00	145 20
Rent at Rest House at Mabaruma ...	...	60 00	60 00
Total Rents ...$	1,888 43	$ 3,448 86	$ 5,337 29
Sale of Assets.			
Anna Regina—Sale of Livestock ...	1,584 00	...	1,584 00
Anna Regina—Sale of land ...	30 00	...	30 00
Anna Regina—Sale of machinery and scrap...	2,812 95	4,198 29	7,011 24
Total Revenue ... $	6,315 38	$ 7,647 15	$ 13,962 53

CENTRAL ROAD ON THE SETTLEMENT SHOWING RIBBON WHICH WAS CUT BY THE OFFICER ADMINISTERING THE GOVERNMENT AT THE FORMAL OPENING ON MAY 7, 1930.

[*Vide para.* 14.

A GROUP OF SETTLERS AND THEIR FAMILIES. [*Vide para.* 21.

COTTAGE WITH VERANDAH AND WINDWARD SIDE SHINGLED. [*Vide para.* 26.

A GOOD GARDEN AND A HAPPY HOME. [*Vide para.* 23.